

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.

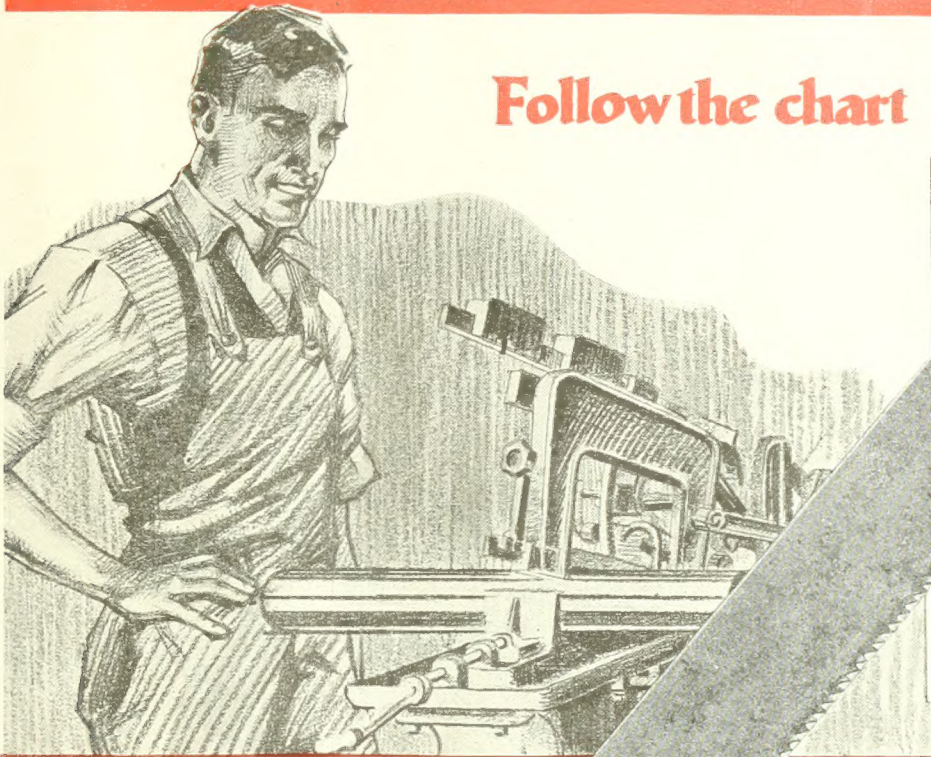
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Follow the chart



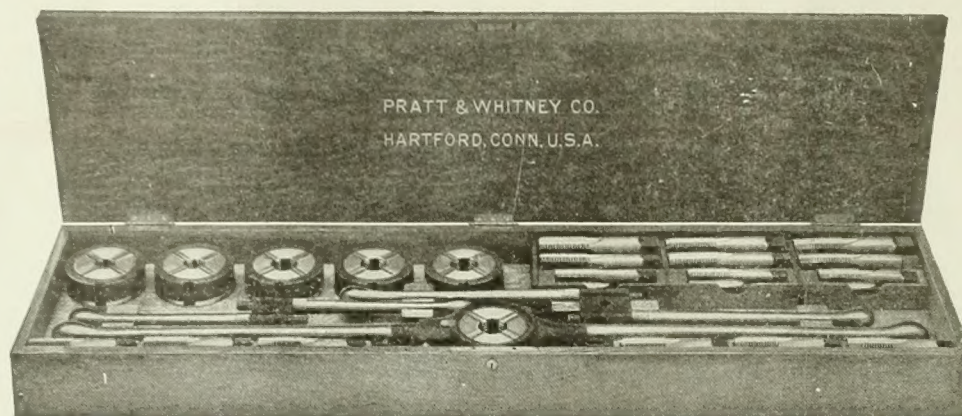
MATERIAL TO BE CUT	NO. OF BLADE FOR HAND FRAME		NO. OF BLADE FOR POWER MACHINE			
	As Made	Fluted or Juli Back	Light Machine	Medium Machine	Heavy Machine	Extra Heavy Machine
Light Angles	102	252	115	262		
Light Channels						
Light Tee Iron						
Light Ornamental						
Heavy Angles	103	250	115-B	255		
Heavy Channels						
Heavy Tee Iron						
Light Structural	112-B			255	254	256
Heavy Structural	112-B			255-B	254-B	256-B
Iron Pipe	102	252	115	262	259	
Cast Iron Pipe						
Brass Pipe						
Solid Stock	103-B	250		255-B	254-B	256-B
Cold Rolled	112-B	250-B		255-C	254-C	256-C
Machine Steel						
Tool Steel	103		114	255	254	256
Cast Iron	112					
Brass	103		115	262	259	
Sheet Metal						
Less than 18 gage	253	258				
Over 18 gage	102	252				

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.
THE WORLD'S GREATEST TOOL AND HACK SAW MAKERS



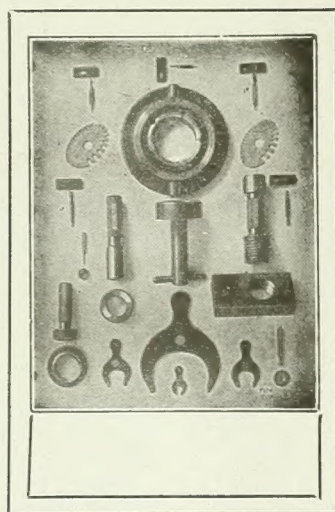
Watch the cost per cut and the cutting cost per job will take care of itself. Different metals cut at different speeds need different blades. Follow the Starrett Hack Saw Chart and for economy's sake use
Starrett Hack Saws

SMALL TOOLS



P. & W. Die-Stock Set No. 4

These sets are furnished in various capacities for either U.S. Standard, S.A.E. Standard, Whitworth Standard or "V" Form. The Pratt & Whitney Policy of highest quality materials, together with the necessary refinement and accuracy, is maintained in all tools composing these sets.



PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

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OF CANADA, LIMITED

Works: DUNDAS, Ontario

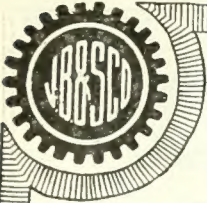
MONTREAL
723 Drummond Bldg

TORONTO
1002 C.P.R. Bldg.

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For Structural, Bridge and Shipbuilding Plants

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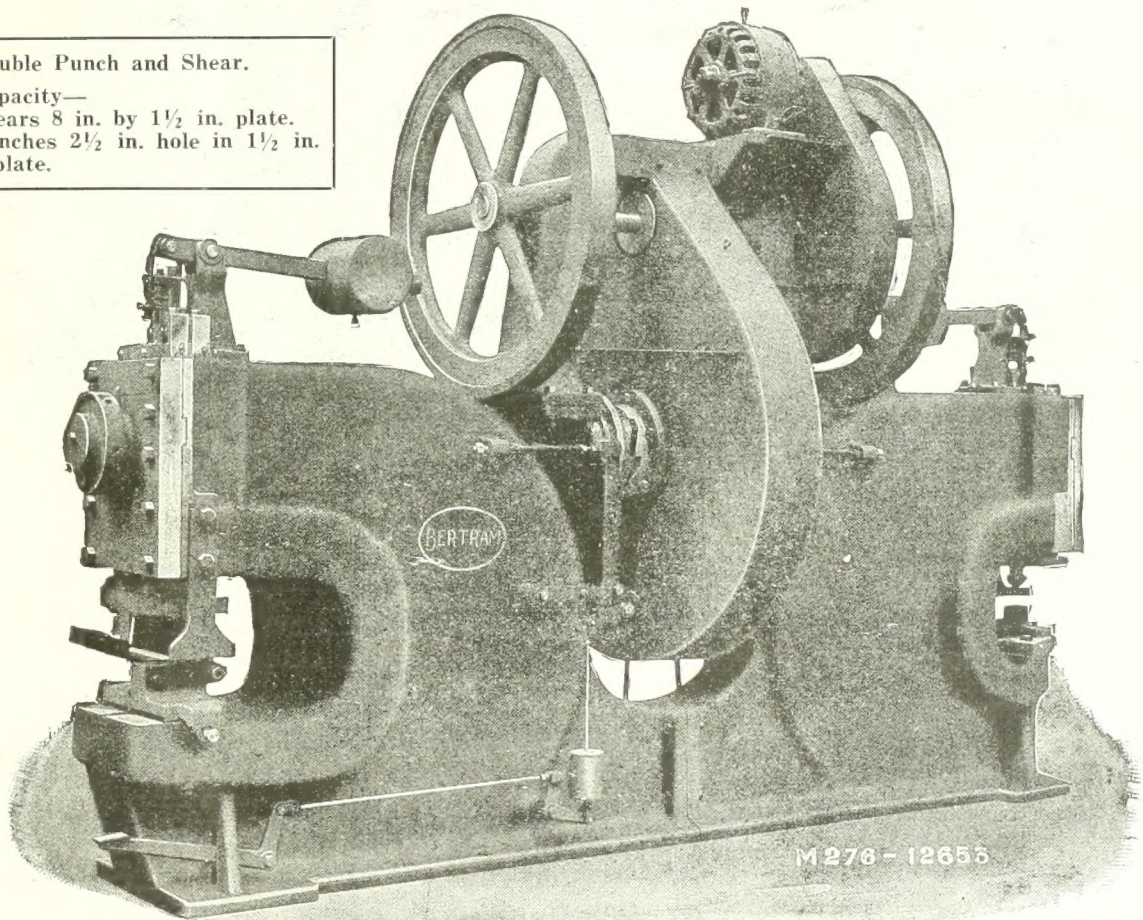
The assistance and advice of our engineers are yours for the asking.

Double Punch and Shear.

Capacity—

Shears 8 in. by 1½ in. plate.

Punches 2½ in. hole in 1½ in. plate.



M 276 - 12655

The John Bertram & Sons Co., Limited

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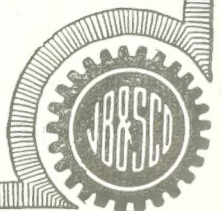
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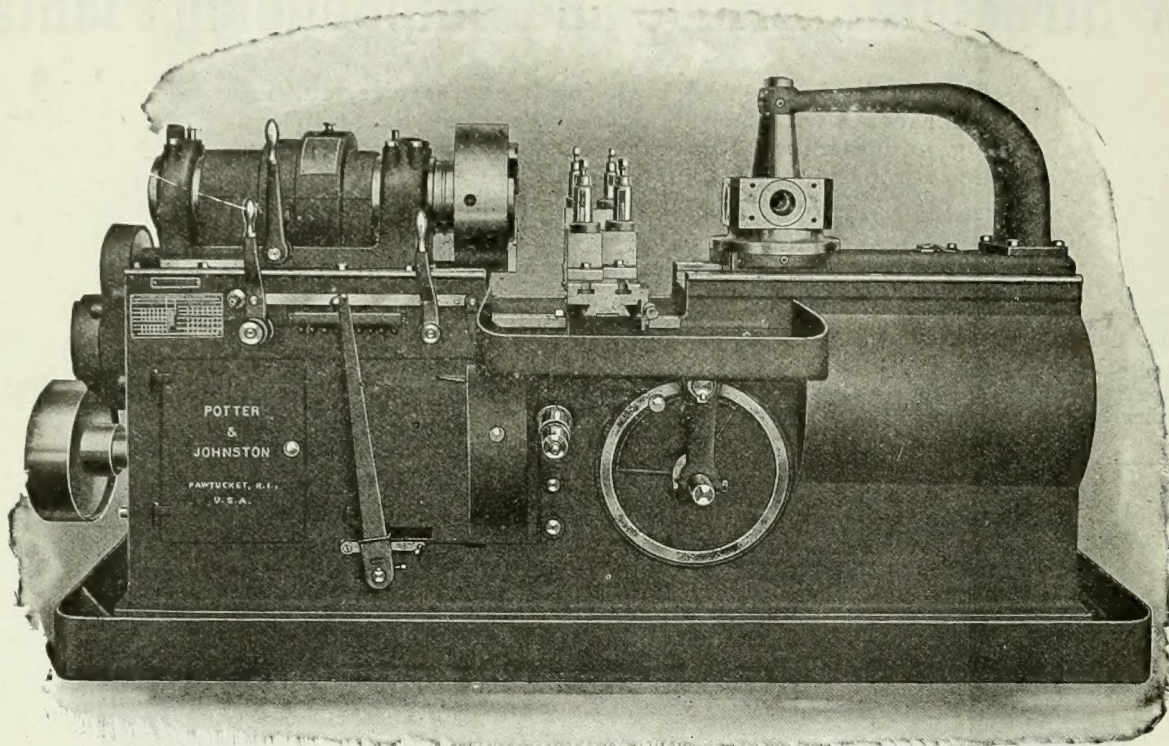
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MANUFACTURING AUTOMATICS

Increase the Output and Reduce the Cost



6-A Potter & Johnston Automatic Chucking and Turning Machine

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Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle $5\frac{3}{4}$ inches diameter, hole $3\frac{1}{2}$ inches diameter.

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All operations are entirely automatic. One attendant can readily run a battery of two to six machines.

In addition to automatically machining all varieties of castings from iron, bronze or steel, also forgings, the machines are also recommended and are widely used for finishing pieces from bar starch which have previously been cut off to length. This is a highly economical method of producing gear blanks, bushings, studs, etc.

Catalog gives full particulars.

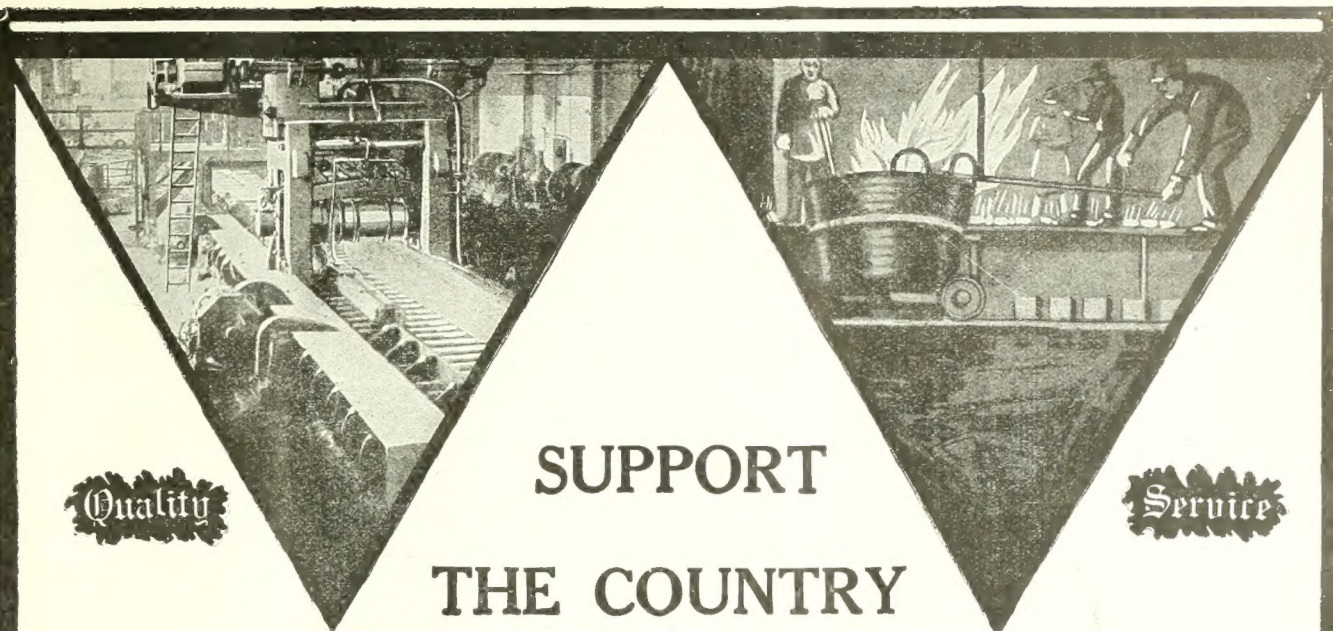
Drop a card for it.

Canadian Offices: POTTER & JOHNSTON MACHINE CO., Pawtucket, R.I.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada

Works and Warehouse: Galt, Ont., Canada



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interests of your family and the community
in which you live, you will

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OF
CANADIAN MILLS**

A Canadian Dollar
is Worth One Hundred Cents
in Canada

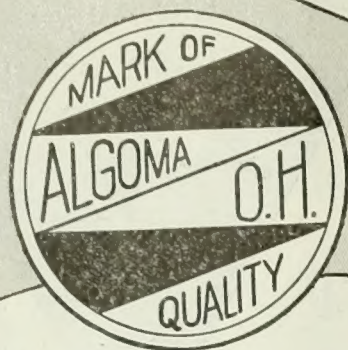
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STEEL COMPANY
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CANADA
LIMITED**

HAMILTON

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ALGOMA STEEL CORPORATION, LTD.



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STEEL RAILS

Open Hearth Quality
(All Sections from 12 lbs
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BESSEMER

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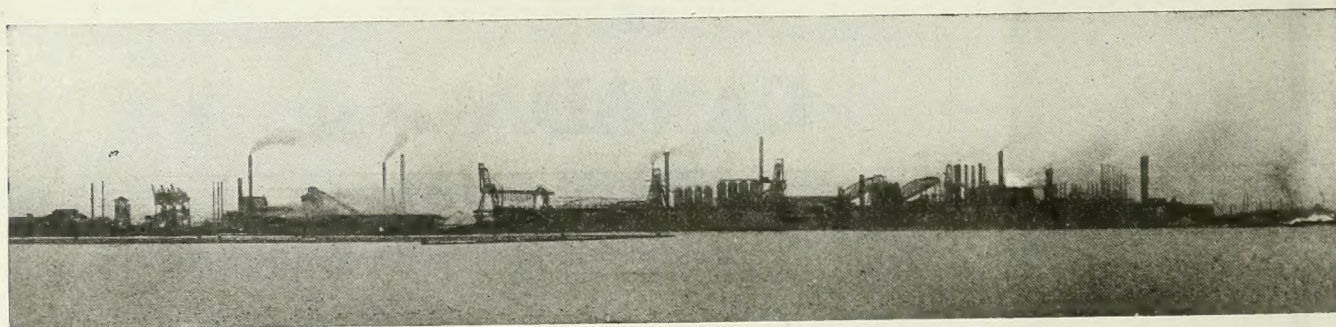
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IRON, BRASS AND BRONZE CASTINGS

Sulphuric Acid. Nitre Cake.



GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT.

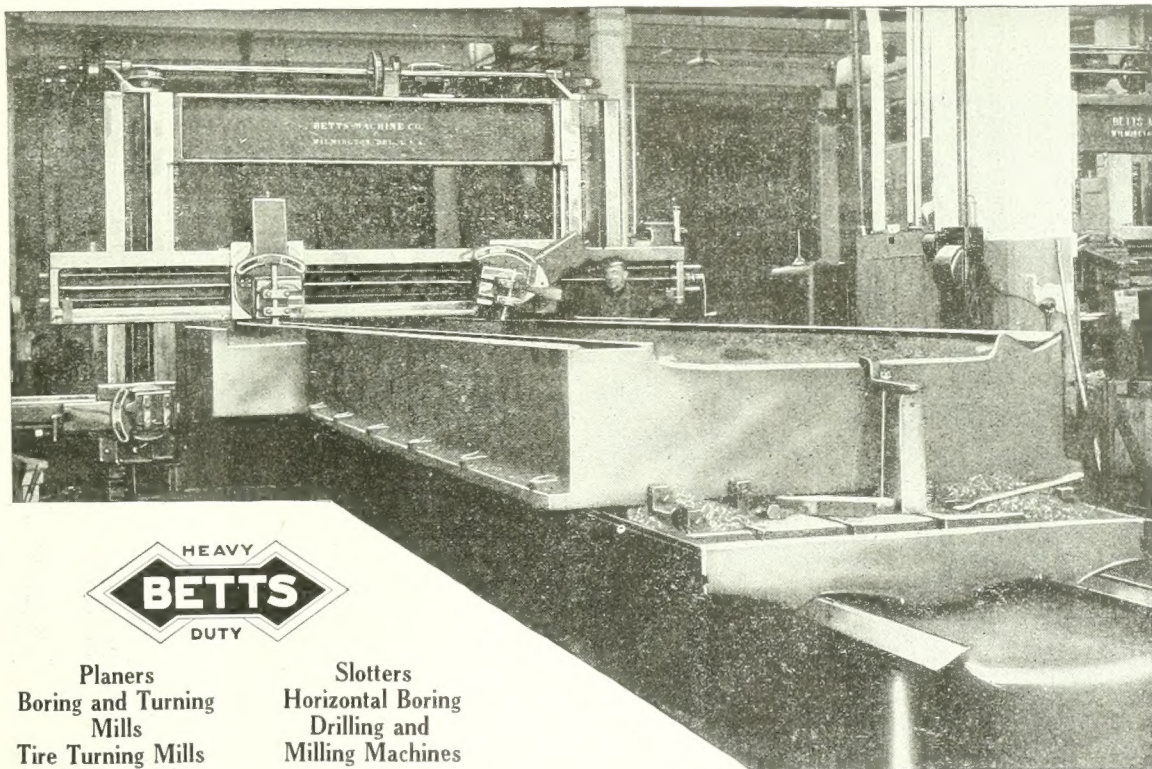
BETTS

16 Years of Faithful Service

The photograph below, taken in our own shops, shows a 22-ton cross planer bed casting being finish-planed on a Betts 120 x 72" Planer. The depth of cut on roughing was $\frac{3}{4}$ " to $1\frac{1}{2}$ ", $\frac{1}{8}$ " feed at a cutting speed of 28' per minute.

This Betts Planer has been in active service 16 years, part of the time on 24-hour duty and continues to perform accurately and faithfully on a wide range of duties. Long life and faithful service are characteristic of all Betts tools because they are built to render service—not to sell at a price.

To avoid regrets—select a Betts. Send for detailed information concerning any or all Betts tools.



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Mills
Tire Turning Mills
Car Wheel Borers

Slotters
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Whenever a strong, dependable hoist is needed, the "Imperial" air motor hoist fills the bill.

Few Parts Mean Less Trouble The "Imperial" has few parts

The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.

Bulletin 8006 will interest you.

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Limited**

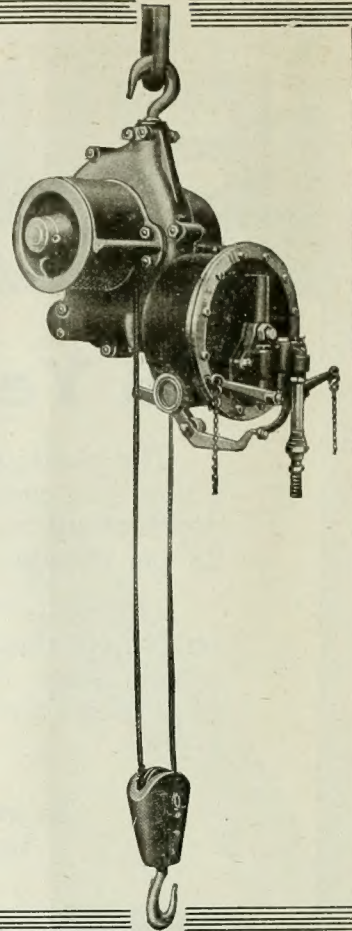
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Swedish mills;
makers of

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HIGH SPEED STEELS,
DRILL RODS, DRAWN
BARS, SEAMLESS TUB-
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WROUGHT AND ROLLED
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A Keen Cutter

Strong in the Neck

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Machine shop foremen and superintendents who invariably specify "WILT" when requisitioning tools know **WILT Drills, Reamers and Milling Cutters** are superior—are absolutely guaranteed against defective material and workmanship—are rigidly inspected before being shipped. To produce more, use **WILT Tools**. To produce more economically, use **WILT Drills, Reamers and Milling Cutters**. Elimination of breakage alone will save you much.

HIGH SPEED AND CARBON TWIST DRILLS

WILT TWIST DRILL CO.

OF CANADA, LIMITED

Walkerville.

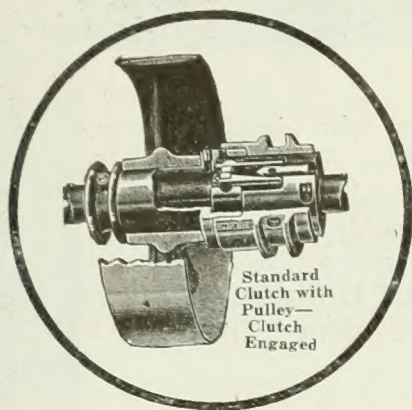
Ontario.

London Office: Wilt Twist Drill Agency, Moorgate Hall,
Finsbury Pavement, London, E.C.2, Eng.

*"Where there's a WILT,
—there's the Way."*



THE JOHNSON FRICTION CLUTCH ON THE LEADING



Machine tools manufactured, is giving entire satisfaction. National Acme Co. say: "It will pull a heavy load. Very easy to shift. Fitted well into the plan of the machine."

Ford-Smith Machine Co. say: "The use of this clutch has speeded up the operation of finishing shells considerably and is standing up excellently under this heavy duty."

Cleveland Automatic Machine Co. said: "Service of this kind requires a friction clutch of correct design and the Johnson Friction Clutch proves entirely satisfactory."

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THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



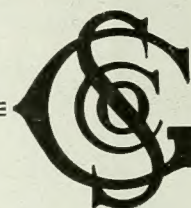
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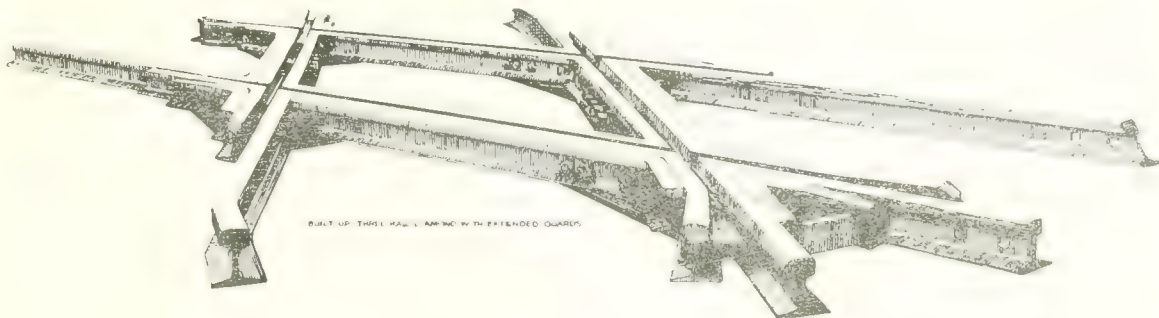
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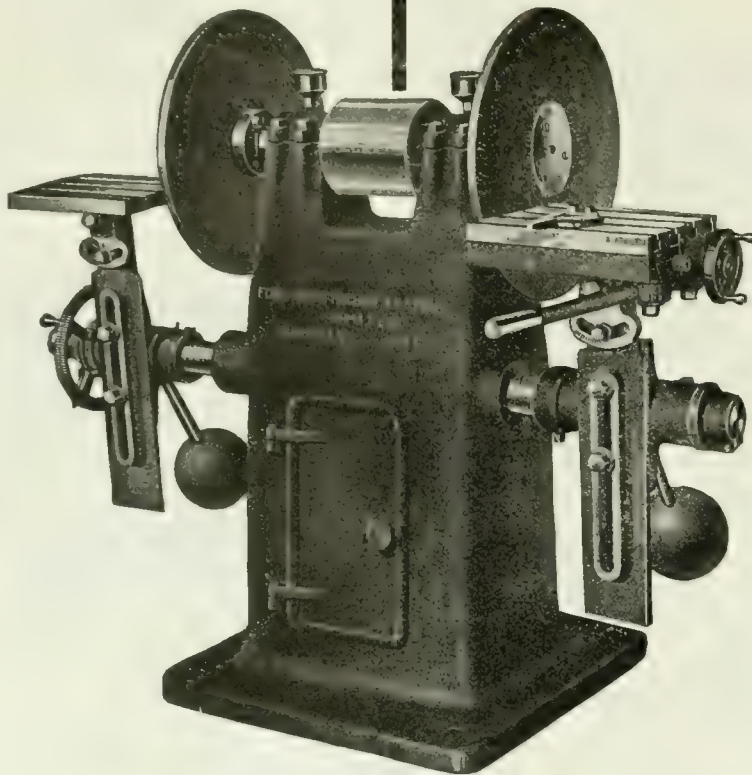


Water Tool Grinder



General Purpose Grinder

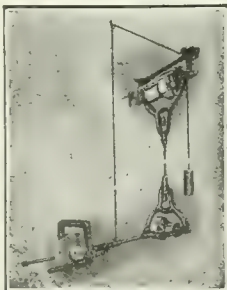
FORD-SMITH GRINDERS



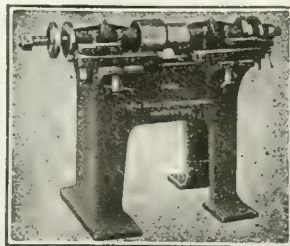
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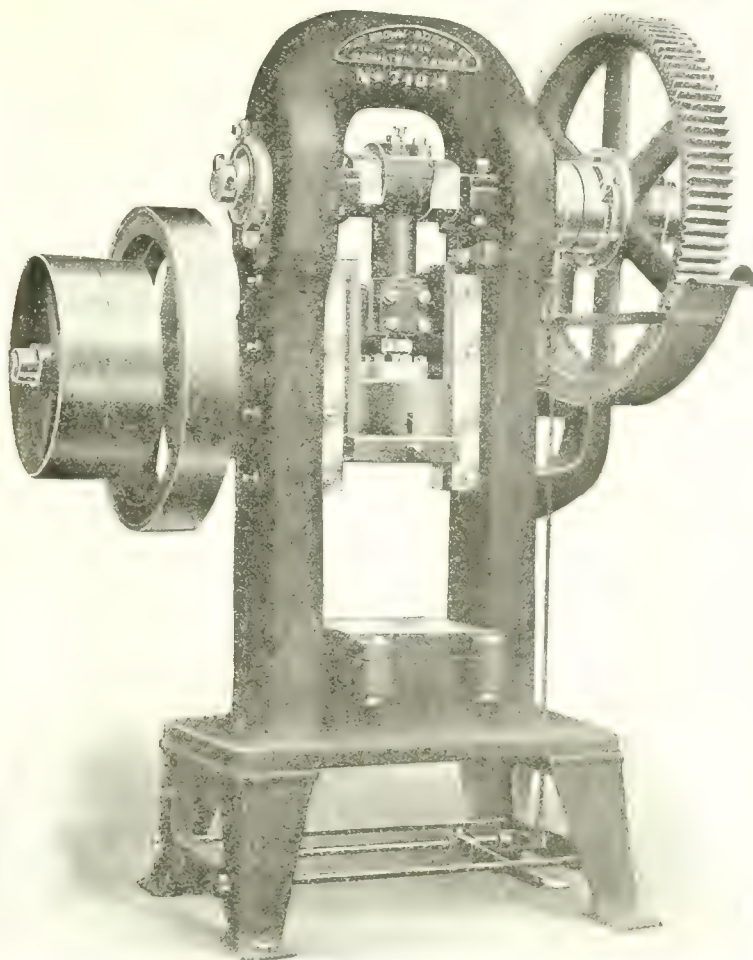


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Heavy Type Floor Grinder

Manufactured by
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No. 740 $\frac{1}{2}$ Geared Press

The Manufacturer's Guarantee

Something you do not get with second-hand equipment, yet in many cases it will offset the difference in price between the second-hand and new machine.

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BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and
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HIGH GRADE STEEL FOR ALL PURPOSES



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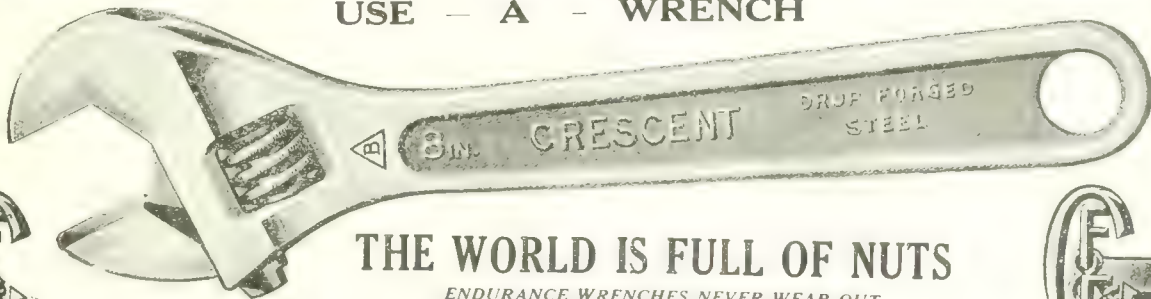
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DON'T RATTLE

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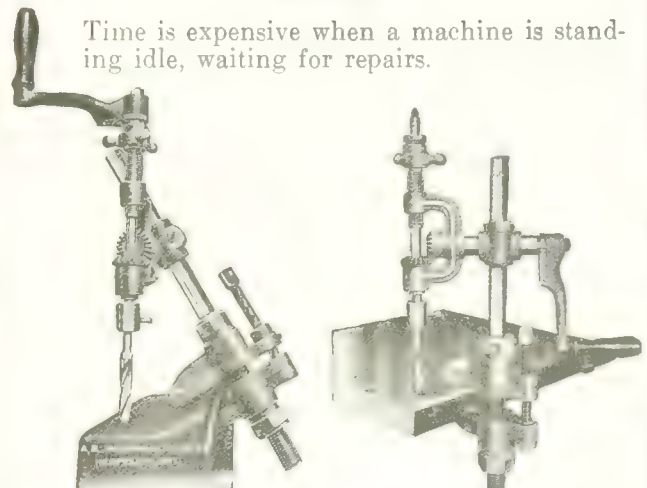
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Jardine Universal Ratchet Drill



Time is expensive when a machine is stand-
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FIRTH'S CARBON TOOL STEELS

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79 West Adelaide St., TORONTO

J. A. SHERWOOD
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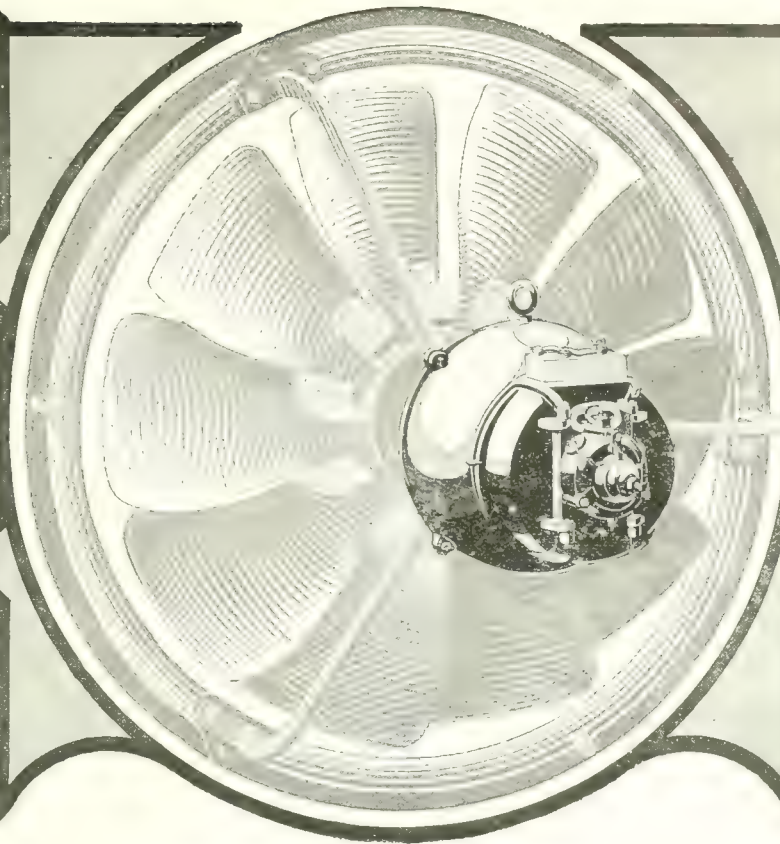
*Hotels
Need
Them*

*Big Kitchens
Should
Have Them*

*Theatres
and Halls
Must Have
Them*

*Mills and
Factories
Can't Do
Without Them*

*Hospitals
Demand
Them*



*In Laboratories
They are
Necessary*

*Restaurants
Swear
By Them*

*In Laundries
They are
Indispensable*

*Big Offices
Should be
Equipped*

*In Dormitories
They are
Essential*

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Elaborate scientific tests have demonstrated that individual efficiency, both mental and physical, is highest and most enduring when the surrounding air is at a temperature of less than 70 deg. F.

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We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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MONTREAL



Steel Ingots
by the
HARMET
Liquid Process

IMPERIAL GENUINE BABBITT METAL *The Highest Grade Manufactured*



Made specially for all HIGH SPEED, HEAVY ENGINES and EXTRAORDINARY HARD WORK

Manufactured and guaranteed to give excellent service by

THE CANADA METAL COMPANY, Limited, FRASER AVENUE TORONTO, Hamilton, Montreal, Winnipeg, Vancouver

THE
TRADE
K-T_A IE
MARK
FOUNDRY
GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

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send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

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CORLISS VALVES

ROLLER BEARINGS

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PISTONS AND CONNECTING RODS

Four cylinders—two on each side—with Semi-Corliss Valve close to each pair, giving greater power and efficiency.

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ALL RECORDS
BROKEN FOR
SPEED, POWER
and ENDURANCE

CHIPPING HAMMERS

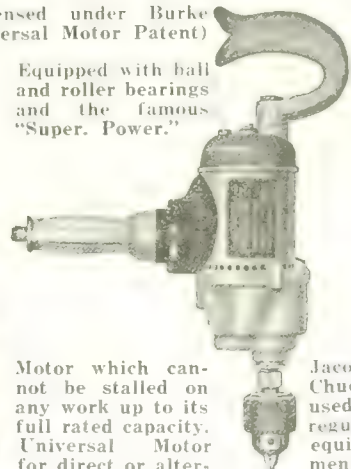


4 Sizes, 1 in. to 5 in.
All parts hardened and ground.

ELECTRIC DRILLS

(Licensed under Burke Universal Motor Patent)

Equipped with ball and roller bearings and the famous "Super. Power."



Motor which cannot be stalled on any work up to its full rated capacity. Universal Motor for direct or alternating current.

Jacob's Chucks used as regular equipment.

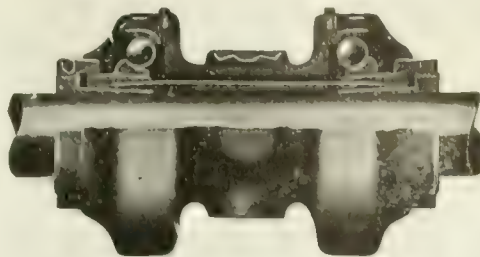
Independent Pneumatic Tool Company

General Offices:

600 West Jackson Boulevard
CHICAGO, U.S.A.

CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1112 Homer St. VANCOUVER.

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Friction
Practically
EliminatedLubrication required
only once or twice
a year

There's a Good Reason

When such firms as Pierce Arrow Motor Co., Ford Motor Co., Bethlehem Steel Co., International Harvester Co., Fairbanks-Morse Co., Goodyear Tire & Rubber Co., and 3,000 other plants installed Chapman Ball Bearings for their transmission machinery they did so for one good reason—because Chapman Ball Bearings eliminate friction and reduce power loss to a minimum.

The power saved by Chapman Ball Bearings will in two years' time pay for their installation.

Chapman Ball Bearings will fit into the hangers you have now—there is no necessity of going to the time and expense of new equipment.

Write for Catalog 3-B, which explains in detail the savings Chapman Type Ball Bearings will effect for you.

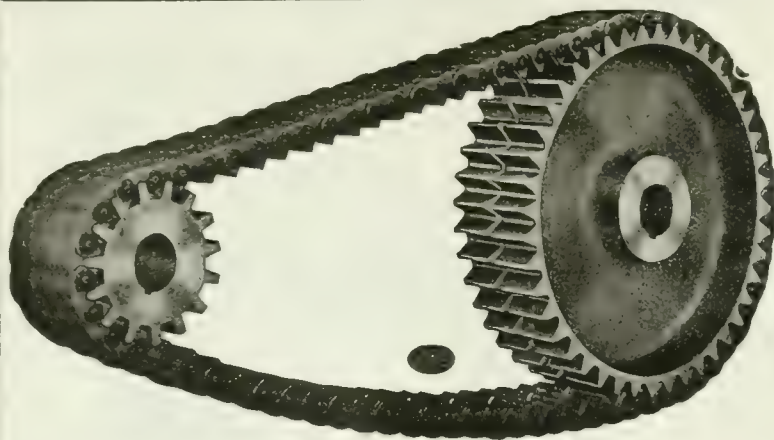
The Chapman Double Ball Bearing Co., Limited

339 Sorauren Ave., Toronto, Canada - 408 Shaughnessy Bldg., Montreal, Que.

The Transmission Ball Bearing Co., Inc.

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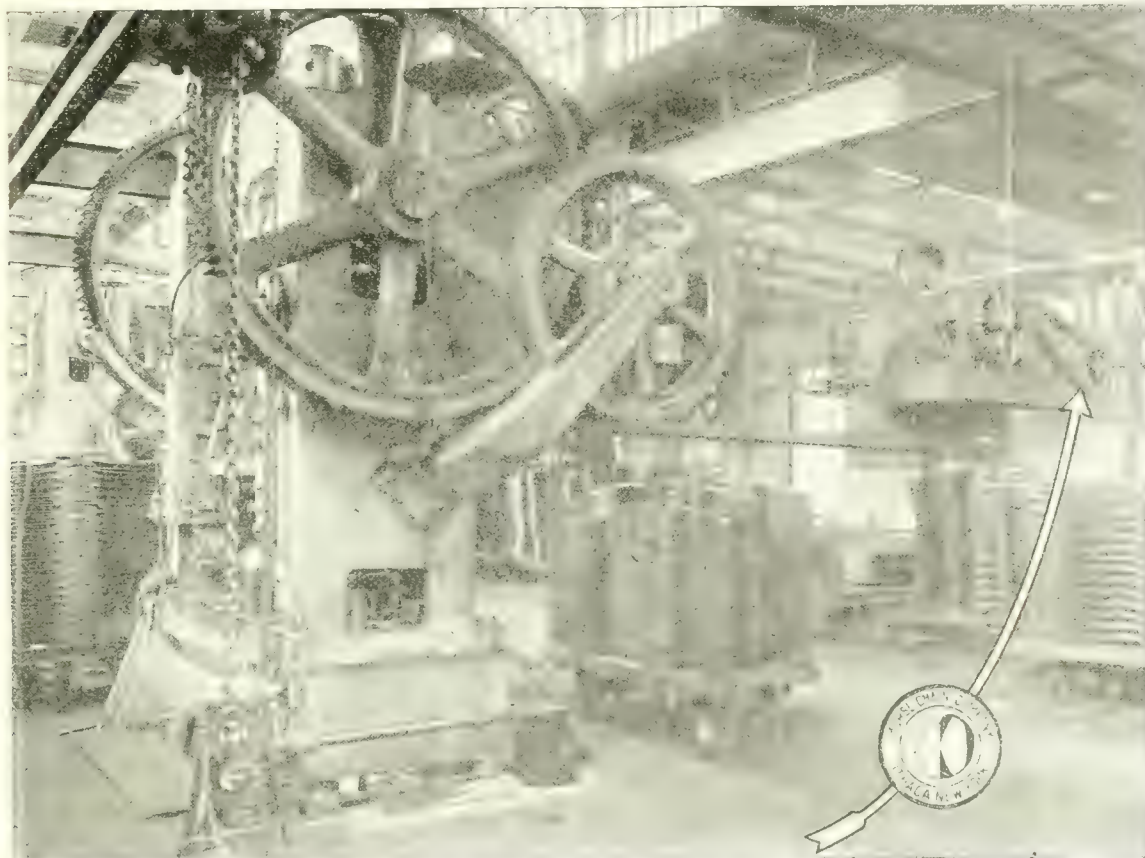


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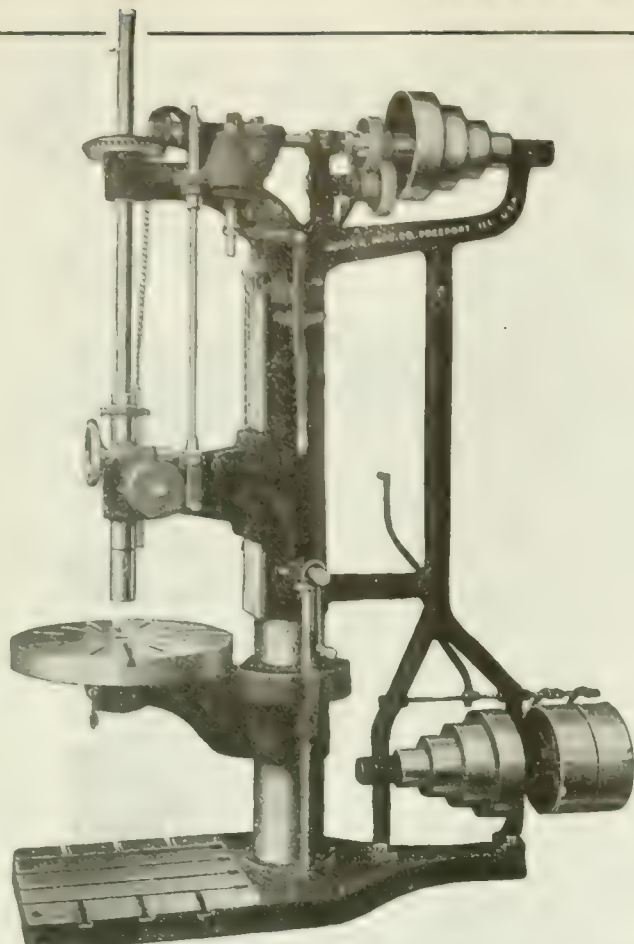


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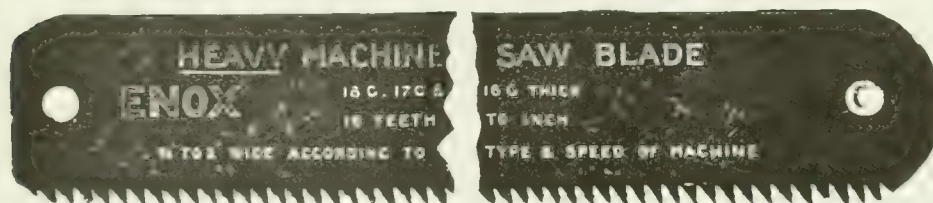
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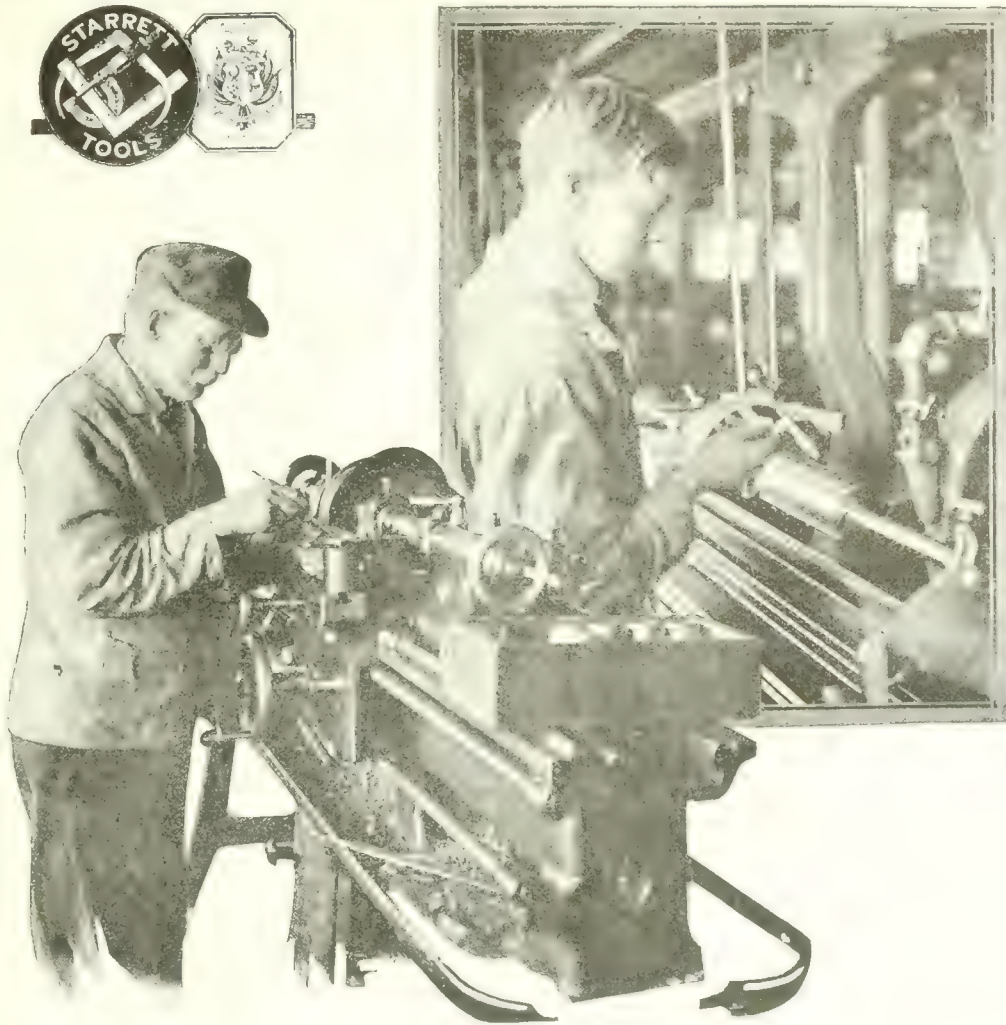
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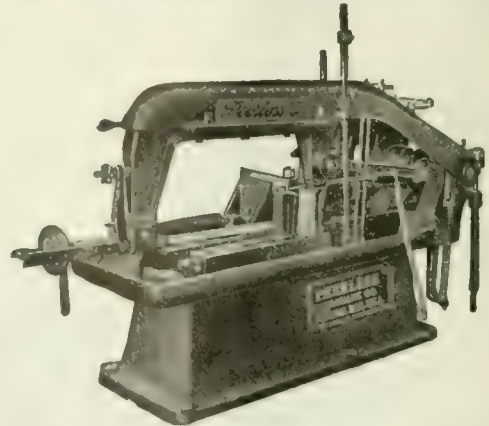
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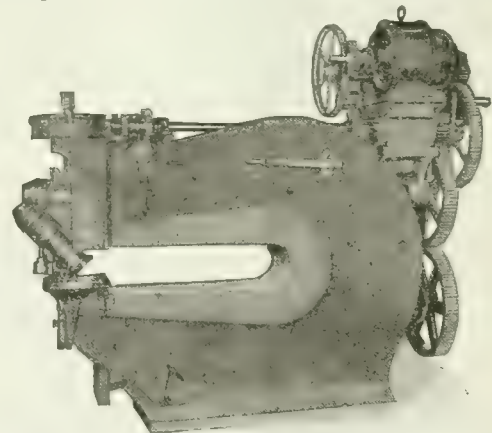
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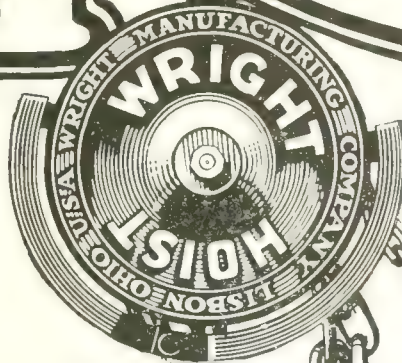
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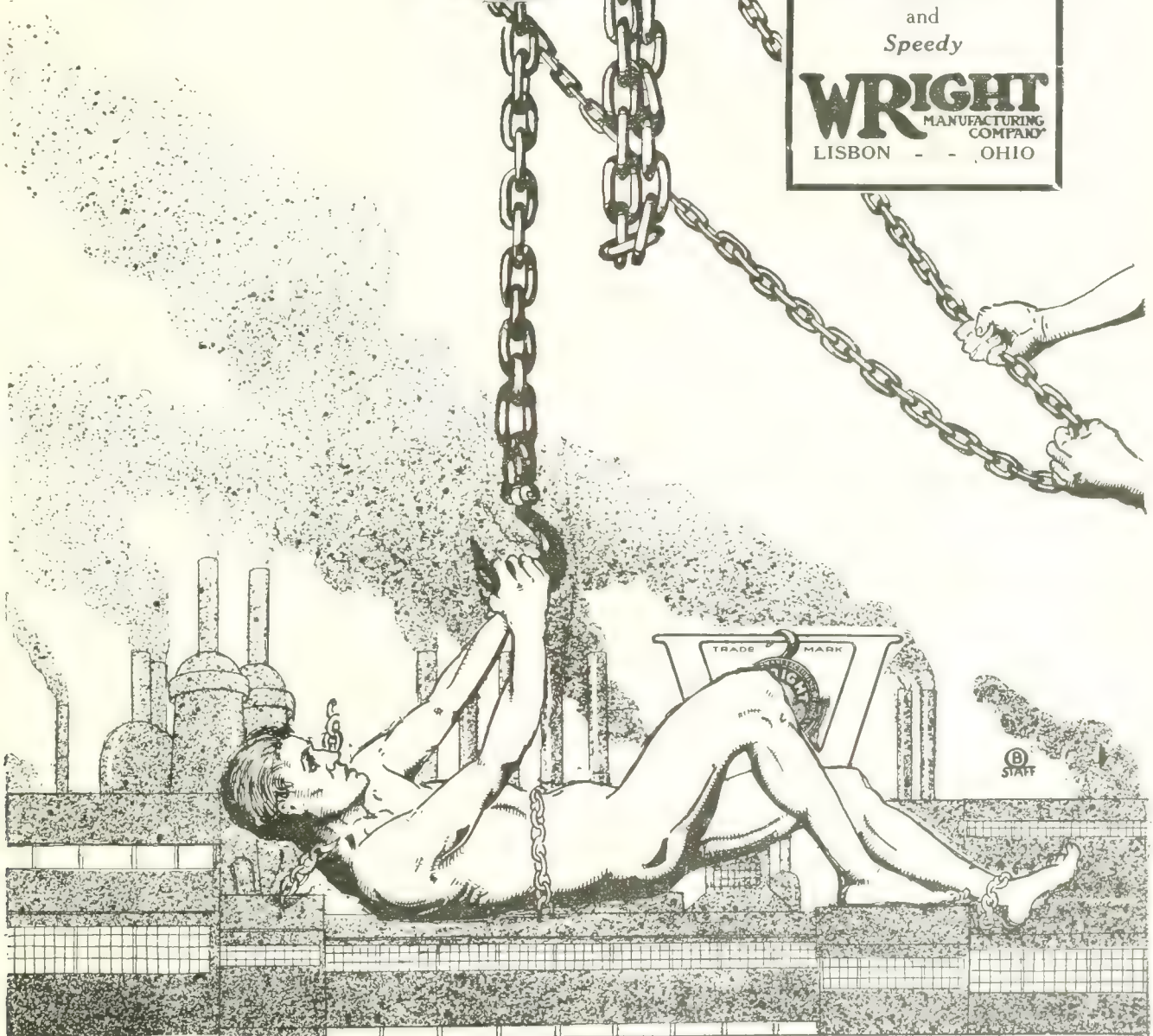
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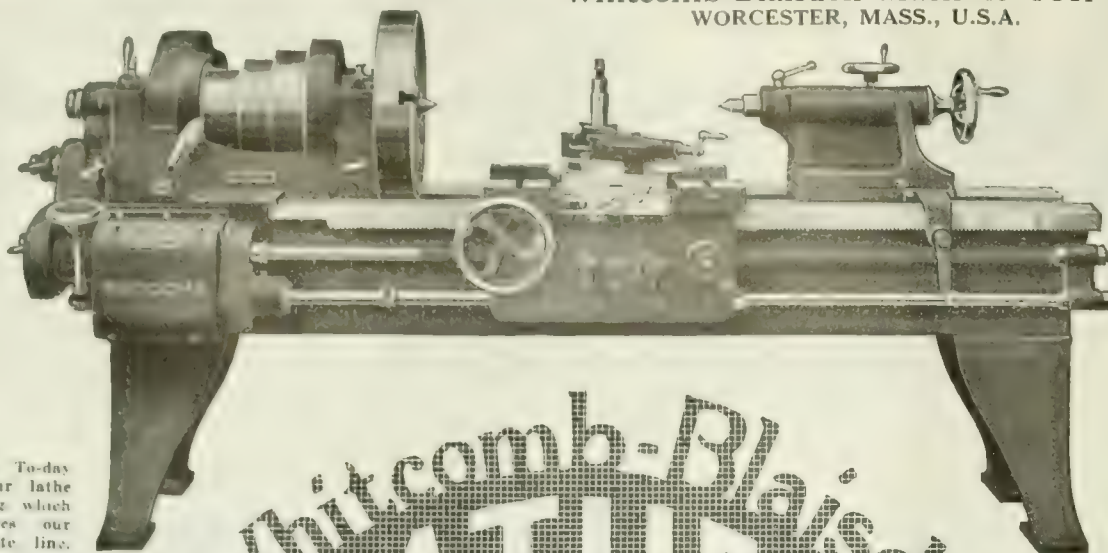
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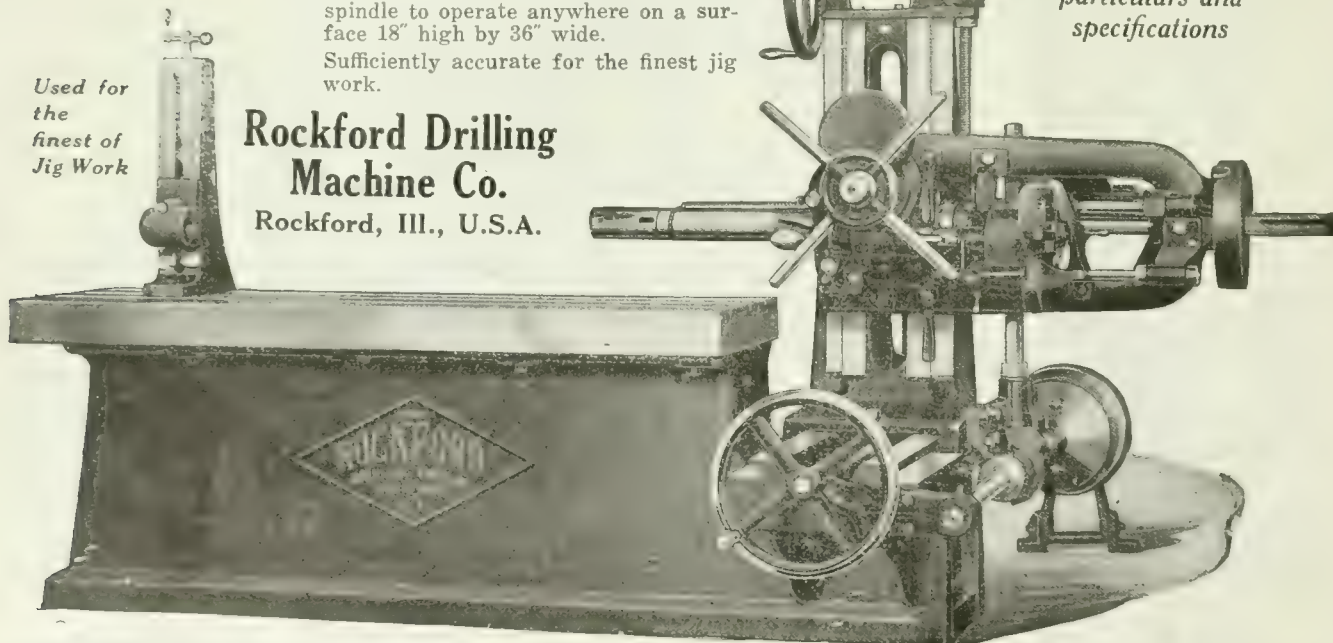
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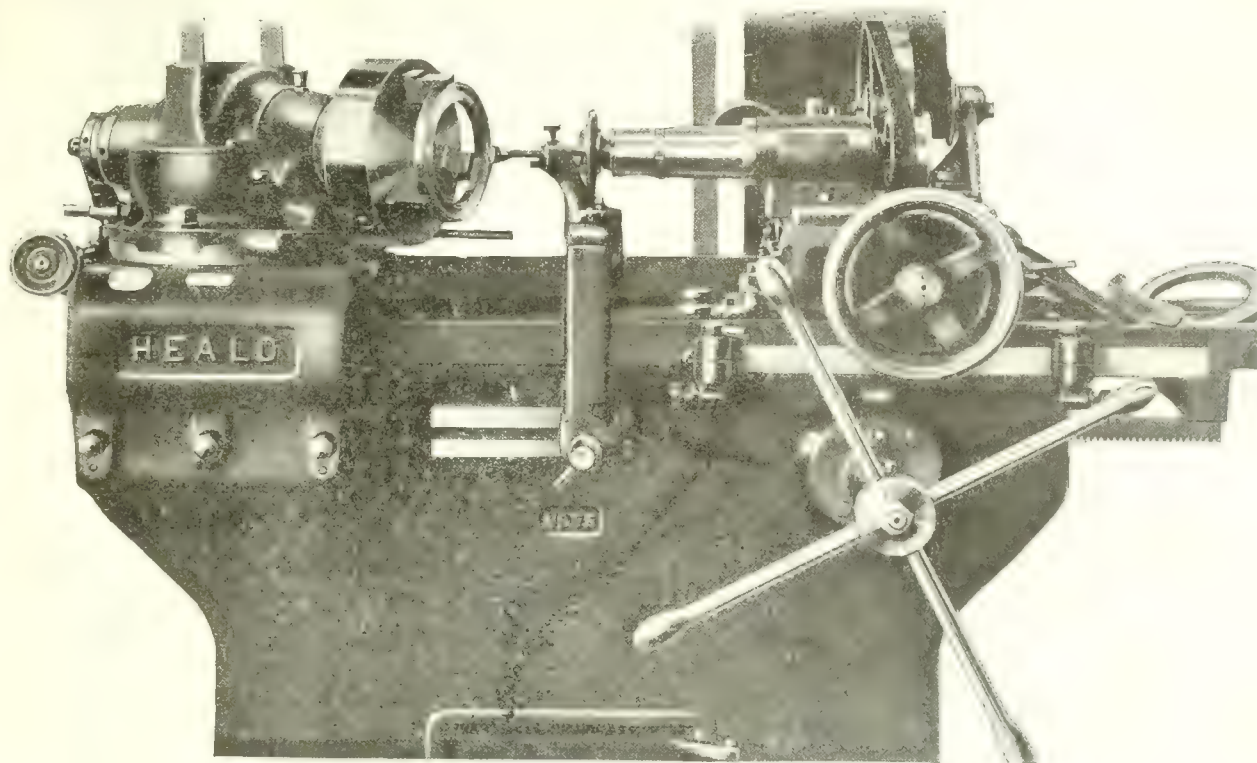
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A Heald Job on a Heald Grinder

The above photo was taken at the Heald plant where a Heald No. 75 Internal Grinder is grinding a hardened steel ball race to be used in the construction of a ball thrust bearing for the 12" Surface Grinder.

Notice the radius truing device adaptable to either the No. 70 or No. 75 Internal Grinders, and which it is possible to either concave or convex

the wheel as desired. In this case the curvature was $11/32$ radius and a mirror finish was produced.

The Heald Internal Grinders, both hand feed and automatic, are not only production machines but are ideal for tool rooms, doing straight and taper work, large or small. The various size wheel heads are units in themselves and easily interchangeable.

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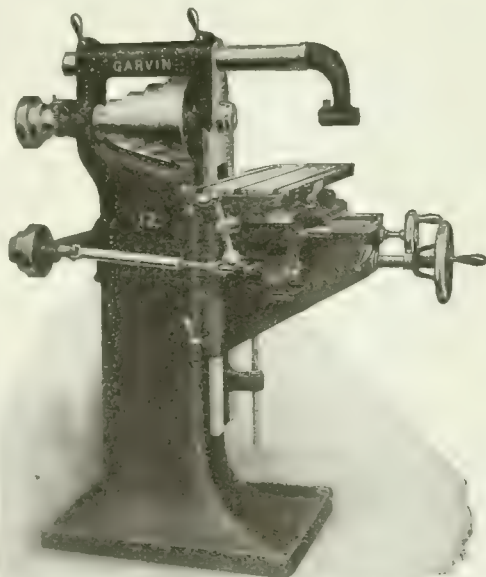
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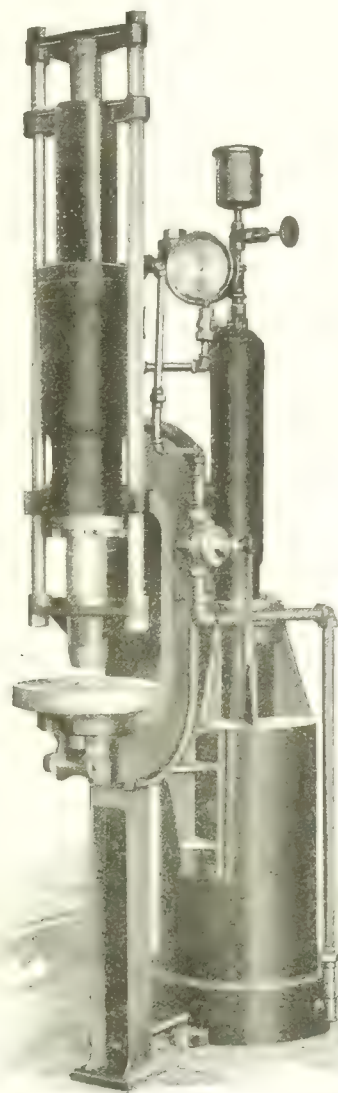


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Notes On Grinding

No. 61A

From a Recent Discourse on Soft Wheels, by H. W. Dunbar

I have often had occasion in talking with some operator in a grinding department who felt that he was more or less in trouble because his wheel was wearing out rapidly or glazing and filling, and he could not produce the large number of pieces per day that he had hoped to, received in reply to my question, "Have you used a soft wheel?" the answer, "Oh, yes, this wheel is a K wheel." In his mind that wheel was soft because it occupied the position in the low scale of the grading list. He had given little thought to the fact that he was grinding work eight, ten or twelve inches in diameter. In each case the K wheel might have been quite a bit too hard for the operation, and again undoubtedly he had paid little attention to the fact that his speeds of work revolution could be of so great assistance to him in causing that wheel to act in a proper manner.

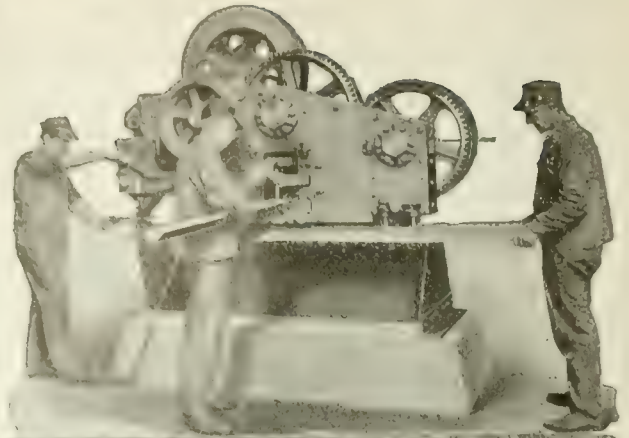
When considering wheel grade to determine the correct one to use, the following points should be kept in mind.

1. That the grade letter has little meaning in so far as the wheel action is concerned, serving only as the means of identifying that particular wheel.
2. The diameter of the work will vary the cutting action of the wheel. The smaller the work the harder the wheel may be and the larger the work the softer it must be, of course, assuming that the diameter of the wheel is the same.
3. The larger the diameter of the wheel the harder the wheel will act. The smaller the diameter of the wheel, the softer it will act, the diameter of work remaining the same in both cases.
4. The wider the face of the wheel in contact with the work being ground, the softer the wheel must be to grind rapidly.
5. Work speeds are provided for the purpose of varying the cutting action of the wheel; in other words, so that the wheel may be made to act soft or hard.
6. The grain size affects the apparent grade of the wheel, finer grains appearing hard while coarse grains appear soft in their action, regardless of the bonding grade.

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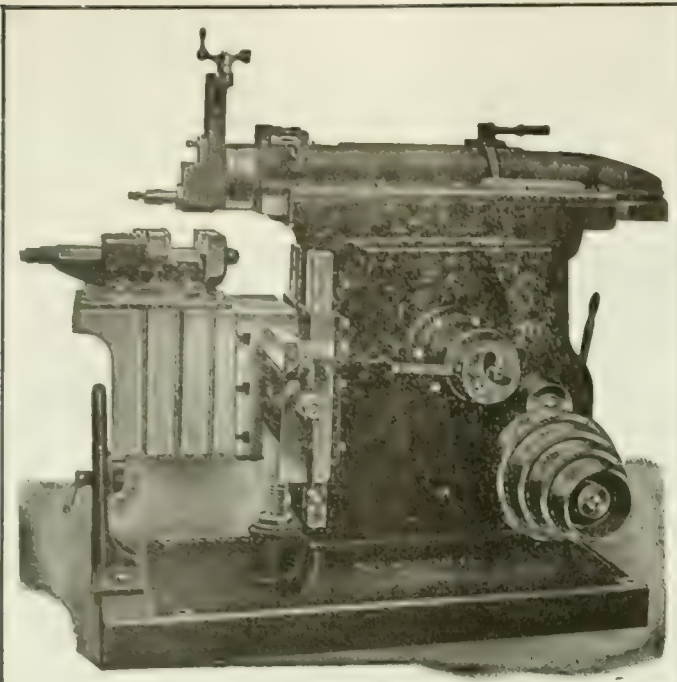
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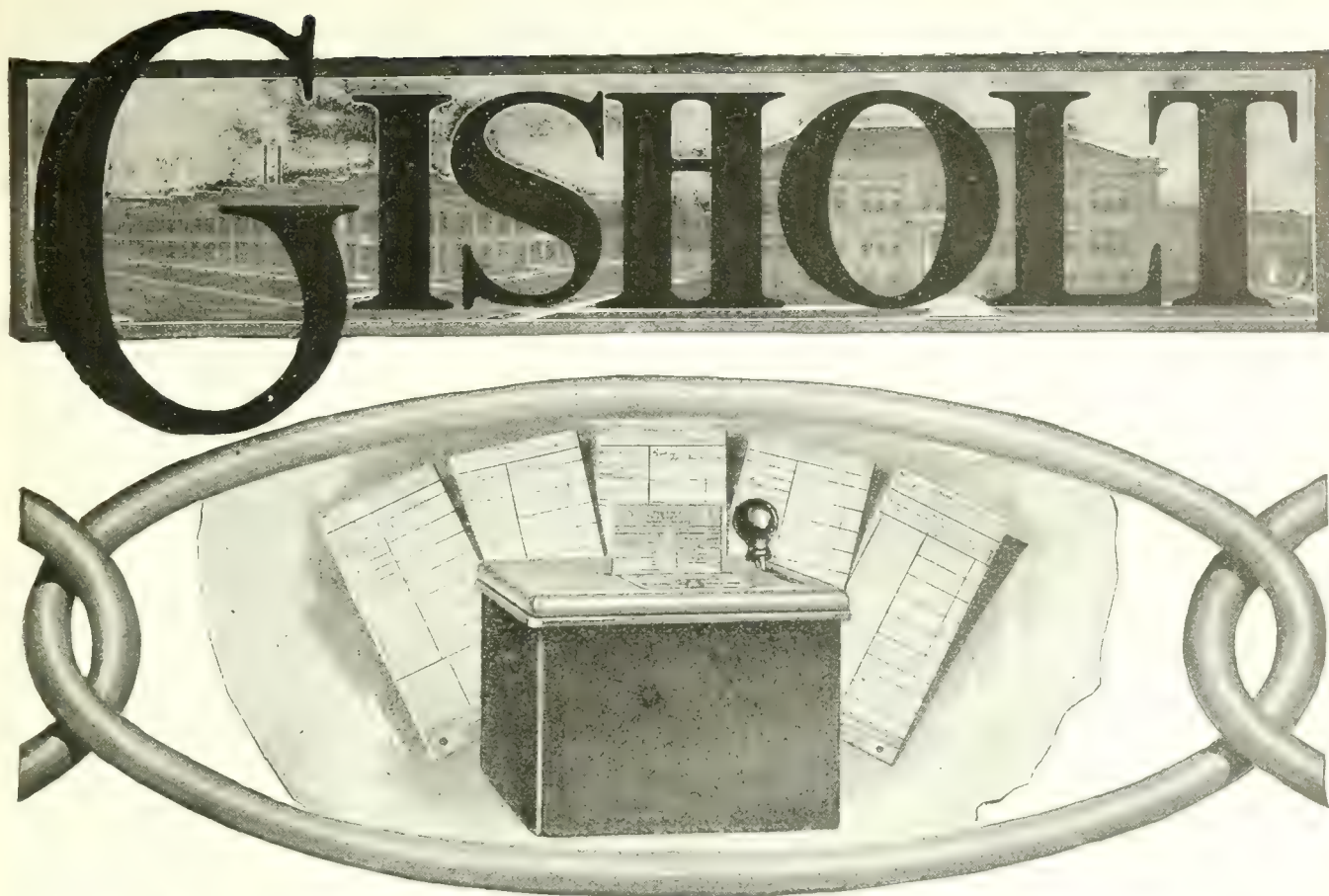
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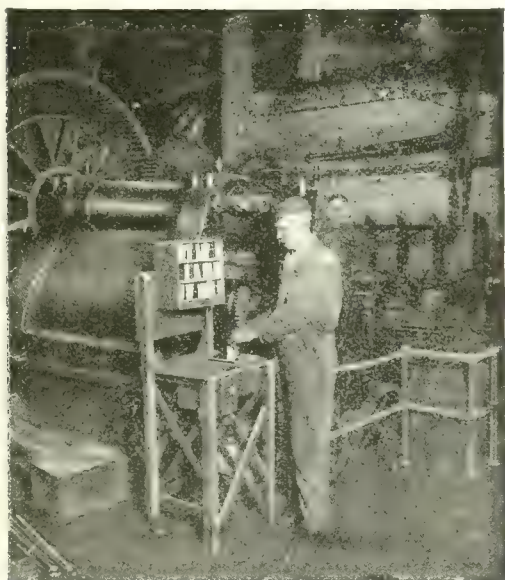
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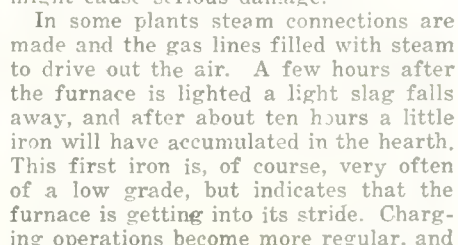
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after about three days iron can be tapped at regular intervals of four hours, but it is usually a month before the furnace obtains its full capacity.

In starting up the stoves, it is usual at first to use some of the early gas to bring all four up to a temperature of four to five hundred degrees. Then one stove is put on a light blast and the other three on their regular gas schedule. As operations continue, stoves must be cleaned at regular intervals, especially when the furnace is working on soft ores, and a large amount of dust is carried in the gas.

There are many difficulties that occur in the operation of a furnace, such as scaffolding, sticking or adhering of the stock to the walls of the furnace just above the mantle. This obstruction causes the uprising gases to pass with greater velocity through any free area, and the scouring action of the gases cuts deep channels in the brickwork. Severe cases of this kind have to be treated by inserting an extra tuyere at the seat of the trouble to cause intense heat to bring away the obstruction, or at times a charge of dynamite is resorted to. At other times break-outs occur with serious results. Tuyeres and cooling plates may be melted, or due to an error in charging, the stock may become chilled. In fact, a blast furnace superintendent has ever to be on the watch for some outward and visible sign that indicates some inward trouble.

Now let us consider what happens inside a furnace. Four things go into the furnace: iron ore, coke, limestone and air, and four things come out: iron, slag, gas and a little steam. How do the changes take place?

Let us take all the various ingredients, pull them to pieces, and see what they are made of:

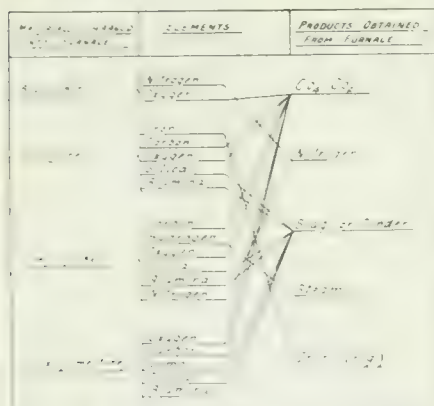


FIG. 1. A TABLE SHOWING THE COMBINED PRODUCTS.

Iron ore—iron, silica, carbon and oxygen.

Coke—Alumina, silica, carbon, nitrogen, hydrogen and oxygen.

Limestone—Alumina, silica, lime, carbon and oxygen.

Air—Oxygen and nitrogen.

Iron—Iron, and many impurities in slight percentage.

Slag—Silica, alumina and lime.

Gas—Oxygen, carbon and nitrogen.

Steam—Oxygen and hydrogen.

Now look at Fig. 1 and see how they

combine to form the products mentioned above.

Before going any further let us get acquainted with some of the gases mentioned.

First—Carbon Dioxide

When any substance rich in carbon burns in a plentiful supply of air, carbon dioxide is formed. The gas is colorless and has no smell; it is heavier than air, and is sometimes known as carbonic acid gas.

The chemical expression for this gas is $C + O_2 = CO_2$, or one part of carbon and two parts of oxygen. This gas will not burn and will not support combustion.

Second—Carbon Monoxide

The blue flame often observed burning on the surface of a coal fire is carbon monoxide gas. It is produced by carbon dioxide passing through the upper layers of heated coal, thus absorbing more carbon.

The chemical expression is CO , or one part of carbon and one part of oxygen. This gas is colorless, tasteless and odorless, is about the same weight as air, but if inhaled is an active poison.

The presence of this gas hanging around a furnace top is a source of great danger, and men are often overcome by the fumes.

Third—Hydrogen

This gas is lighter than air, burns with a pale blue flame, but will not support combustion. It is colorless and odorless, and when mixed with air it forms a highly explosive mixture.

The chemical expression is H .

Fourth—Oxygen

Oxygen has no taste, color, or smell, ordinary combustible substances burn more brightly in oxygen than air. This gas is indispensable to life, and is the part of the atmosphere which is used up in the process of combustion, decay and fermentation.

The chemical expression is O .

Oxygen combines with many things and forms oxides.

Fifth—Nitrogen

Roughly, the atmosphere contains eighty parts of nitrogen and twenty parts of oxygen. Nitrogen will not burn and does not support combustion, and, as may be expected from a gas forming so large a part of the atmosphere, it is without smell, taste, or color.

The chemical expression is N .

Now what happens in the furnace, hot air is blown in the tuyeres and meets hot coke; the oxygen in the air combines with the carbon in the coke and forms CO_2 . This gas comes in contact with other portions of red hot coke and changes to CO , $C + CO_2 = 2CO$, or carbon monoxide.

There is also some vapor in the air; the oxygen combines the carbon of the coke and leaves free hydrogen.

The nitrogen in the air blast remains to all intents and purposes unchanged.

This mass of gases rises upward with great pressure, and at a temperature

varying from 2,200° Fahr. at the tuyeres to 400° Fahr. at the furnace top.

Starting at the top, let us see how the limestone and ore are influenced by these gases. At about twenty feet down from the top the limestone begins to crack and give off CO_2 gas; forty-five feet down it begins to soften and melt, uniting with the silica in the ore and the ash of the coke, the whole uniting to form a slag that floats on the iron, protecting it and forming a collecting blanket for impurities.

The iron ore begins to give up its oxygen at a lower temperature and increases in action as the temperature increases; deprived of the oxygen, the ore becomes a pasty mass, which melts upon reaching the bosh and drops in large drops into the hearth.

The above is a very simple expression of the changes that occur, stated without going into the necessary chemical expressions essential if a full explanation is desired.

The gases that are given off from the furnace top are roughly as follows:

Gas	By Weight	By Volume
Nitrogen (N)	52.59	54.51
Carbon monoxide (CO)	33.80	34.97
Carbon dioxide (CO_2)	13.47	8.36
Hydrogen (H)14	2.16
	100	100

Part of the surplus or waste gases are used for heating the stoves as already mentioned. About 40 per cent. of the total gas generated is usually sufficient for this purpose, leaving 60 per cent. available for burning under boilers supplying steam for electric power and blowing engines.

Electric power, of course, is coming into greater use every day. Furnace bells that used to be raised either by steam, air, or hydraulic cylinders are now being electrically operated. Skip hoists that only a few years ago were always driven by steam engines are now being operated by electric motors.

Blowing engines are for the most part of the reciprocating vertical type, but already the turbo blower is entering the field, and on account of the vast saving in floor space, is fast superseding the more picturesque but less efficient vertical engine.

If the blast furnace is connected with the steel plant the product is usually conveyed in hot metal cars (see Fig. II) to the mixer in the open hearth department. If otherwise, the product is usually cast into pigs of a convenient size for handling. The casting of the pigs was at one time effected by making molds in the sand floor of the cast house. With the increased cost in labor, pig machines have come into use where the molds are attached to a moving chain. The chain passes underneath the pouring spout of a ladle, each mold is filled, passed down the chain into a tank of water, is cooled, comes out of the tank, and is discharged into a waiting car.

The disposal of the slag is quite a problem. When the plant is situated

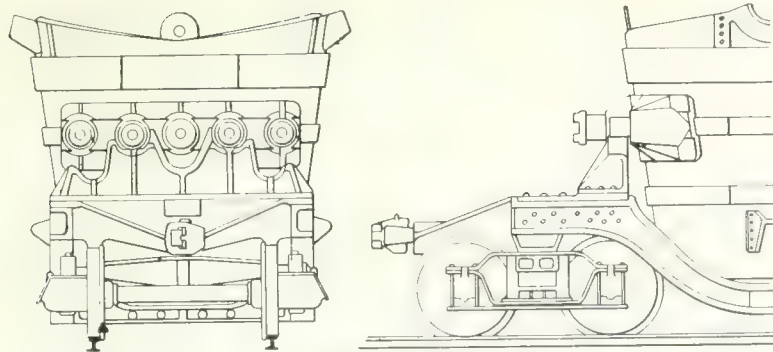


FIG. 2 THE HOT METAL CAR.

near a river or ocean shore the slag is poured into cars (see Fig. III) and dumped at the water's edge. If the plant is inland, great mountains are built up of the slag.

For a young country, Canada is fairly well supplied with blast furnace plants. The Dominion Iron and Steel Company, Limited, Sydney, N.S., have six furnaces, five having a capacity of 280 tons per day, and one having a capacity of 350 tons per day. The Nova Scotia Steel and Coal Company, Limited, Sydney, N.S., have two blast furnaces, one in operation and one under construction, each having a capacity of 250 tons per day. The Steel Company of Canada, Limited, Hamilton, Ontario, have two blast furnaces, one of 200 tons capacity per day and the other 300 tons per day. The Algoma Steel Company, Limited, Sault Ste. Marie, Ont., have three blast furnaces, two of 250 and one of 450 tons per day. Atikokan Iron Company, Limited, Port Arthur, Ont., have one blast furnace of 175 tons capacity per day. The Canadian Furnace Company, Port Colborne, Ont., have one furnace of 300 tons capacity per day. There are several other furnaces in the country, but mostly of small capacity or not in operation at the present time.

The product that we now have is iron, free from its earthly impurities, strong but brittle, possessing great compressive strength, but very little tensile strength.

We will next consider its cause of weakness and the way it is refined and the results of that refining.

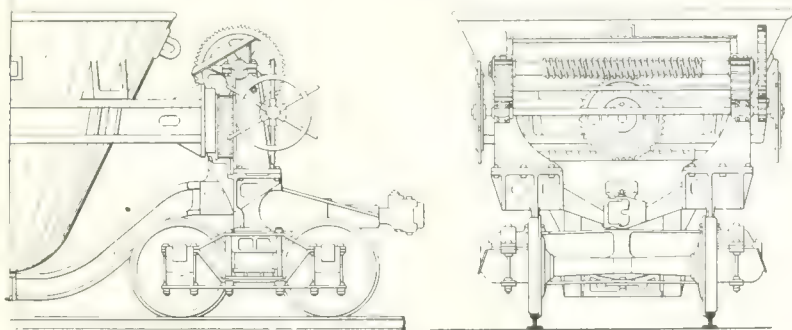


FIG. 3 A GENERAL VIEW OF CINDER CAR.

ACTIVITIES OF WELDING SOCIETY

One of the activities of the new American Welding Society is to be standardization. If any considerable progress is made in this one activity alone, the Society will have fulfilled a very high mission. While it is true that the underwriters' labora-

tories examination and registered label service has done much to keep up the general requirements on any acetylene consuming appliances, standardization on a scale possible and desirable in the acetylene industry would seem to be assured more readily by a bureau specializing in the one field in which we are most interested. Standardization in the automobile industry was laughed down 25 years ago, but no one factor has been more instrumental than standardization in the automobile industry's present state of development. If standardization was possible and successful in the automobile industry, it holds promise of equal benefit for the acetylene industry.

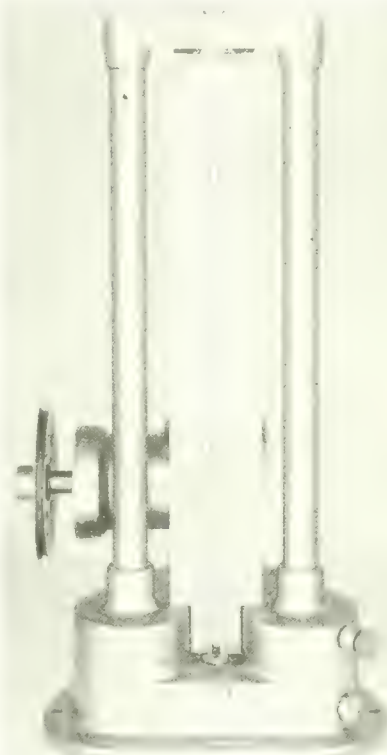
A NOVEL TACHOMETER

By FRANK C. PERKINS

THE accompanying illustration shows a unique speed indicator developed at Hartford, Conn. This tachometer is a permanently accurate instrument. It is a portable instrument for indicating revolutions per minute of dynamos, motors and shafting, and consists simply of a centrifugal pumps, a reservoir for liquid and an indicating tube. The only moving part is the paddle wheel in the centrifugal pump. This has radial blades and hence, indicates when run in either direction. When the paddle wheel is revolved, the liquid is forced out of pump and up the indicating tube by centrifugal force. The reservoir is connected by balanced openings to the centre of the pump and the liquid is

This makes the graduations open and easy to read at the upper part of the tube but too close for convenient reading at the bottom. Hence the scale is graduated only from the maximum down to about one-fifth the maximum. The graduations on the scale on front page represents variations of speed of one per cent. at top. A skilled observer can easily read the indications to within one-tenth of one per cent. at the top. Special scales with fine graduation can be furnished.

It will be seen that the reservoir is divided into 2 parts and the indicating tube is placed in the centre of gravity of the free surfaces of the liquid in the reservoir so that a slight inclination of the instrument does not appreciably vary



GENERAL APPEARANCE OF TACHOMETER

its reading. The shaft of the paddle wheel is vertical so that no stuffing box is necessary and but a very slight amount of power is required to drive it. The paddle shaft is driven through a pair of bevel gears from a substantial horizontal shaft carried in ball bearings. The housing for this driving shaft can be rotated through more than 180° so that the instruments can be belted or geared from any direction. The vertical position of the paddle also serves to quickly eliminate any air bubbles which might be entrained in the liquid when the instrument is filled.

There is a displacement plunger provided for adjusting the level of the liquid to zero when it is at rest. There is a valve for throttling the passage from the pump to the indicating tube but this is used only when the speed varies suddenly. Kerosene colored with aniline dye is the liquid used.

discharged through balanced openings in its periphery.

It may be stated that the vertical height between the liquid in the reservoir and that in the indicating tube is approximately proportional to the square of the speed or revolution of the paddle.

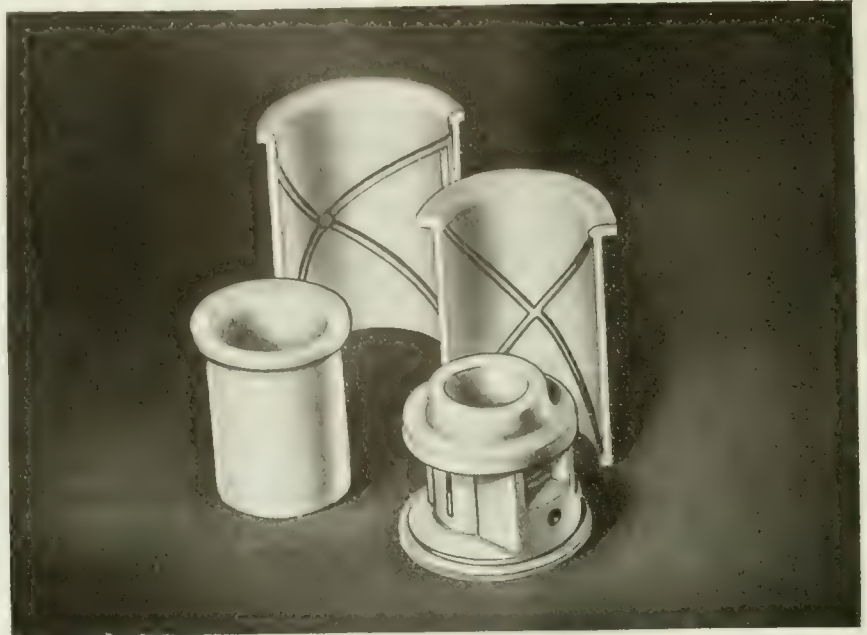
Use Die Castings and Eliminate Machining

Herein is Described From the Viewpoint of the Franklin Co., Why Die Castings Should be Used in the Design of Machinery to a Much Greater Extent Than They Are at the Present Time

THE manufacturing problems of Canada have changed greatly during the past few years. The need of rapid production in war materials has built up factories capable of large quantity production where before manufacturing was small. Canada is today looking forward to a future that will mean still greater manufacturing achievement, and that will bring to the manufacturers of Canada a keener interest in everything which tends toward increased efficiency.

Among the many methods developed in the United States within the past 25 years, with a view toward improving large scale production, the process of "die-casting" has been widely accepted as a means of eliminating machining, and as such has gained steadily in favor. "Die-casting" is performed by forcing molten metal into steel molds under such pressure that after solidifying, its surfaces conform so minutely to the interior of the steel mould as to yield practically finished results. As a matter of fact there is usually less variation between two "die-castings" out of the same mould than between duplicate pieces machined by one and the same workman. Die-castings have long ago ceased to be of an unknown quantity. They have taken their recognized place with stampings, screw machine parts, forgings, etc., in the specifications for many well known products, among them automobiles and accessories, phonographs, electrical instruments, adding and billing machines, milking machines, cream separators, aeroplanes, motor boats and stationary engines. In fact, there are few lines of manufacture which have not found some use for die-castings.

The H. H. Franklin Manufacturing



AUTOMOBILE ENGINE BEARINGS DIE-CAST BY THE H. H. FRANKLIN MFG. CO.

Co. were the pioneers in the die-casting industry, Mr. Franklin having developed the process and having put it on a commercial basis as far back as 1892. In 1900 an exhibit of Franklin die-castings received recognition at the Paris Exposition, and by that time their advantages had been recognized by manufacturers of phonographs, telephones and other electrical instruments, cash registers and miscellaneous accounting devices. The castings were in those earlier days mostly small and made from low fusing alloys. But with the growth of the automobile industry came a marked advance in the production of die-castings.

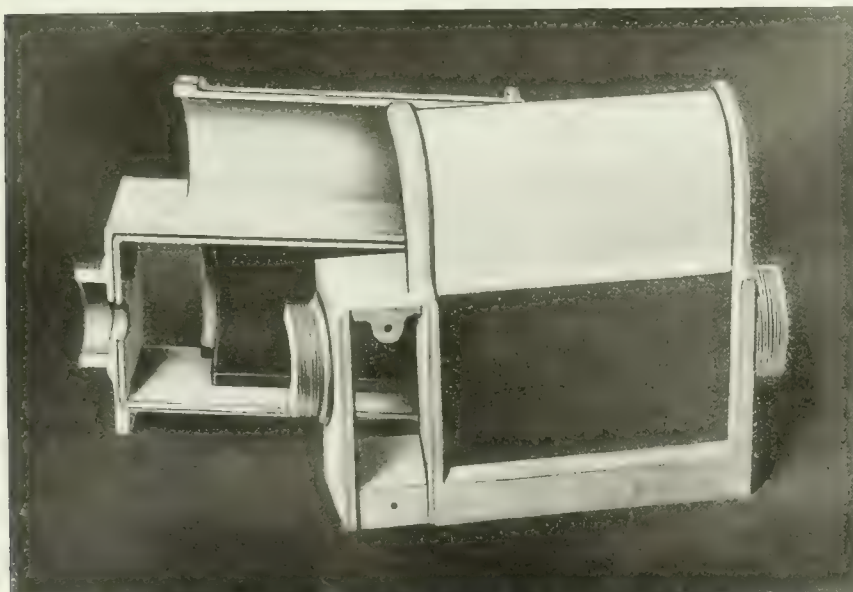
They were found of service not only for engine bearings but also in the framework for magnetos, lighting systems, oil, water and air pumps, engine governors and many other accessories.

The most recent recognition of die-castings has come through the world war, every die-casting firm being taxed to its utmost in the production of various parts carrying priority classification.

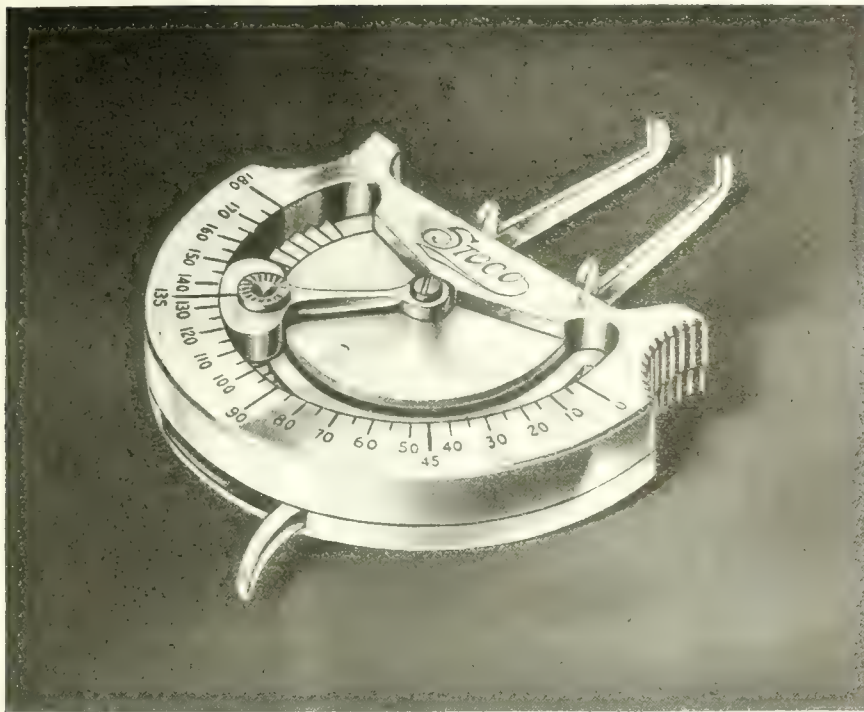
The addition of aluminum to the other alloys previously used made the die-casting process especially valuable in the production of small parts for aeroplanes, telescopes and binoculars, gas masks, bombs, machine guns, and numerous other devices where lightness was required. On the other hand, the standard die-casting alloys found ready use in the production of smoke bombs, hand grenades, shrapnel, truck governors, magnetos, lighting systems, and for the bearings in tractor and truck engines, and air compressors. Even drill stands, formerly considered as an advertising novelty, were recognized as important machine tools and given a high priority rating because of their wide use in shops doing Government work. The close of the war again releases to the general trade the various die-casting firms, all of them with organizations and methods more highly developed than ever before.

The metals most commonly used may be divided into the following groups:

(1) Aluminum alloys (usually the standard No. 12 aluminum, consisting of approximately 92 per cent. aluminum and 8 per cent. copper, and manufactured by the Aluminum Co. of America.)



MAGNETO FRAME WITH IRON POLE PIECES CAST IN POSITION.



OPTICAL INSTRUMENT MADE COMPLETE FROM FRANKLIN DIE-CASTINGS EXCEPT FOR SPRINGS AND SCREWS.

(2) The zinc base or white metal alloy sometimes incorrectly known as white brass. This is employed in the widest range of casting, the exact analysis varying with the requirements. As a general rule it compares most closely with cast iron as regards weight, strength and wearing qualities.

(3) Babbitts or tin base alloys. These are most commonly used in the production of high speed bearings or such parts as require great acid resisting qualities.

(4) Lead base metals chiefly employed in the production of slow speed bearings. During the war they were also commonly used in the production of shrapnel plugs and hand grenade parts.

The low fusing nature of most of the alloys as compared with brass or steel makes possible the introduction of pins, bushings or hardened blocks at points requiring special wearing qualities. This is of value, for example, in the manufacture of magneto frames where the iron pole pieces are accurately located in position when producing the die-cast frame.

The dies used in the production of die-castings are of necessity expensive, and the process is not suited to small quantity production. This has somewhat restricted the use of the castings in Canada. But the change in manufacturing conditions due to increased quantity production is likely to revolutionize manufacturing methods during the next few years and result in an increased demand for these parts in Canada.

When planning to use die-cast parts there are certain general points, which, if borne in mind, will increase results in service obtained. (1) In dealing with steel cores, necessary in a process producing finished parts, undercuts or recesses in the interior wall of the casting

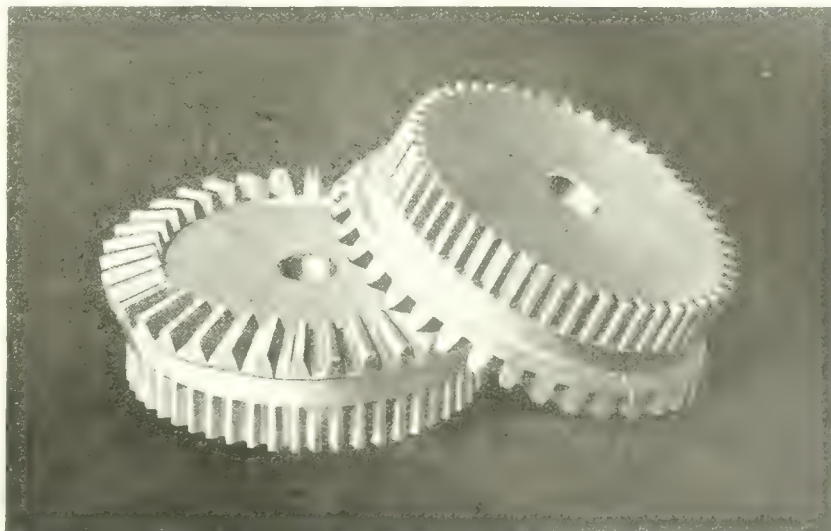
should be avoided. In many cases it is, of course, possible to use collapsible or sand cores, but this increases the cost of both dies and castings. (2) A slight draft is in many parts desirable but not always necessary. (3) No allowance for shrinkage or machining need be made in making drawings except where excessive accuracy is required, or where a machining operation is required in order to true up an assembly. (4) It is cheaper to cast raised than depressed letters but both are practical. (5) Small filets added at sharp corners greatly strengthen the castings and increase the rate of production. (6) Where zinc or aluminum base alloys are used, the walls of the castings should be at least 1-16 to $\frac{1}{8}$ of an inch thick, according to the size of the part, but when softer metals are used they can be still thinner. (7)

Castings can be held to the accuracy of .001 in. to .003 in., according to the size and nature of the parts produced and the metal employed. (8) The best results are obtained in parts weighing under a pound in aluminum, and 2 or 3 pounds in the zinc base metal. Larger and heavier parts can often be produced satisfactorily. (9) Die-castings are not as a general rule made in competition with screw machine work, cheap stampings, or sand castings, which require little or no machine work.

THE STRENGTH OF FERRO-CONCRETE VESSELS

Owing to rumors of less satisfactory experiences with ferro-concrete vessels abroad, a Danish ferro-concrete ship-building company has asked the Director of the Norwegian Veritas for his opinion. It may be mentioned in this connection, that the Norwegian Veritas was the first institution of its kind to issue rules for the classification of sea-going ferro-concrete vessels and to classify such vessels. A fair number of ferro-concrete vessels and lighters have been built in Norway to Norwegian Veritas class, so that the institution has some experience with this method of construction. The director has now given expression to an opinion, which reads as follows: In the experience the Norwegian Veritas has had so far with regard to sea-going vessels of ferro-concrete, such vessels have proved themselves technically satisfactory, inasmuch as they have proved watertight and of sufficient strength. There have been no cracks which have caused leakage, and no trouble has been experienced in making the repairs necessary after collision or grounding.

Peterborough.—The contract for the Hunter Street high level bridge at Peterborough has again been awarded by the council to the Russell-Townsend Co., of Toronto. Of course, the by-law will be submitted to the council, and, as usual, might be revoked in the meantime. The Russell-Townsend's tender calls for \$228,000, that is providing, of course, they do not build the steel arch.



COMPOUND SPUR AND BEVEL GEARS DIE-CAST BY H. H. FRANKLIN MFG. CO.



WELDING AND CUTTING



Various Jigs as Applied to the Welding Trade

Some Examples of Welding Jigs and Methods for Overcoming Distortion Are Taken Up by the Author, Who Presented This Paper Before the British Acetylene and Welding Association

By R. S. MILNE

(Continued from July 3rd issue.)

ANOTHER jig used for the manufacture of the same articles is shown in Fig. 16. In this case a boss "A" and stiffening cup "B" had to be welded to a hemisphere "C" at "B1" and "C1." Here again the hole in the boss had to be truly concentric with the axis of the sphere.

The hemisphere is supported on the casting "D," while the bottom edge is registered by ring "E." From the base of this casting spring two pillars "HH" supporting cross-bar "J," in which a hole is bored concentric with rings "D" and "E," through which passes pin "K" into the hole in boss "A," the pin being a nice sliding fit to the hole about two-thousandths less in diameter than the low limit of hole in boss. As the limit of the hole in "A" was only four-thousandths of an inch, the pin is always practically a fit to the hole in "A," and ensures that this must be concentric with the axis of the sphere. The pressure on pin "K," to hold the whole together during welding, is given by plate "L" and stud "M." This makes not only a very quick method of fixing and releasing, as about one turn of the nut will slacken plate "L," so that it can be turned out of the way while pin "K" is removed, but "L," being made of spring steel, while giving the required pressure, allows for expansion during welding.

This jig, like the last one described, is fixed on a pin at "O," at a convenient angle so as to turn easily during welding.

You will notice that the edge of the boss "A" is thinned to about the same thickness as cup "B," and the edge of cup "B" is thinned to about the thickness of the hemisphere, which greatly assists sound welding.

The hemispheres shown in the two preceding Figs. 14 and 15 had afterwards to be welded together and to be an exact overall length after welding.

As the welding already referred to caused slight shortenings and distortion, a cutting device was resorted to for cutting off the hemispheres to the correct length after the parts had been welded

on. The hemispheres were left up to that time with rough edges as they came from the press. A diagram of this device or machine is shown in Fig. 17.

The cutting blowpipe is held in a swing arm "P" at an angle, so as to make a bevel cut which will give the necessary chamfer for welding. "Q" is a wheel which keeps the nozzle of the pipe always at the correct distance from the work. The work is attached to spindle "R." "S" is a fast and loose pulley,

As soon as the cutting jet of oxygen is opened, the belt is thrown over on to the fixed pulley, which starts the work revolving. The result is the well-known clean cut obtained with machine cutting devices.

In order to avoid the waste of time involved by slowly revolving the work a whole revolution, if a backfire occurred, or the cut failed at one part for any other reason, a ratchet device was fixed at "T" enabling the work to be quickly pulled round by hand.

Two further forms of joints in spherical work are shown in Figs. 18 and 21, both are for the same purpose, but the first gave rise to so many failures that the second was resorted to.

The test applied was 60 lbs. per sq. in. internal, and 200 lbs. external pressure. This puts a strain of 3 tons and 10 tons respectively on the weld, besides which the article, weighing some 7 cwt., was lifted by the cover on this flange. The snatch of a carelessly handled crane might put quite unknown stresses on it, but the design shown in Fig. 18 should stand this if properly welded.

Some causes of defects were:

1. The groove A had to be correct to the hundredth part of an inch in width, depth and diameter, and the contraction, after welding, distorted the groove, as shown in Fig. 19, with the result that the Not Go gauge would enter and the fitter was obliged to hammer the inner edge back cold, putting severe strain on the weld.

2. The diameter frequently distorted oval, so that the diameter gauge would enter one way of the diameter and not on the other. This was corrected by cramping when cold and put a further strain on the weld.

3. Perhaps the greatest of all the causes of trouble was that one was supposed to keep $\frac{1}{8}$ inch face at C, Fig. 19, consequently the welder, in fear of melting away the edge of the ring too much failed to make a weld at all.

Except where such fine limits are re-

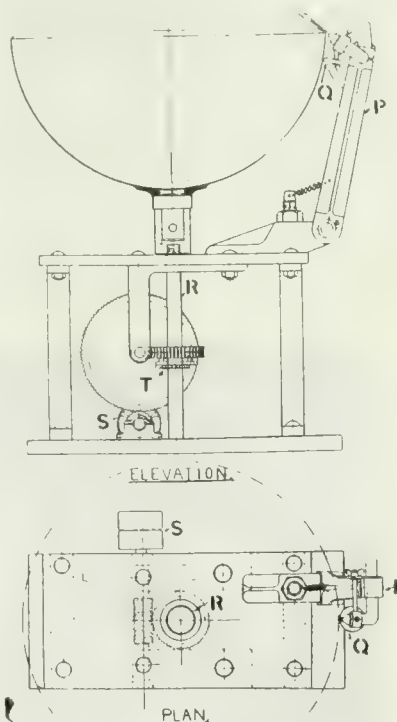


FIG. 17.

which is coupled to the line shaft in the shop with a belt. Spur and worm reduction gears bring the speed at which the work is revolved to the speed at which the blowpipe will do its work.

The blowpipe, which is an ordinary hand cutter, is lit and the work heated.

quired in the groove, the design is, I think, fairly sound, and many of the failures were doubtless due to thoroughly defective welding. Anyhow, I was responsible for the welding of some 1,500

when the ring was removed the distortion, though reduced, was still about 1-16 inch.

Fig. 23a shows a photograph of two of the articles with the ring welded on

off any large surface of the hemisphere and also absorbs a large amount of heat from the hemisphere plate, thereby preventing the burning of the thin edge of the hemisphere, before the thicker mouthpiece is brought to welding temperature.

The execution of this weld had the effect of making the hemisphere shorten about 5-16 inch and distort slightly on the bottom edge. I had these machined at the bottom edge before putting on the mouthpiece, but, if I had to do this job again, I would resort to a cutting device like that already shown for a smaller hemisphere, as it is quicker and cheaper than machining and just as effective.

While I hold no brief for this design of joint, and do not consider it a good design, it certainly is an instance where suitable jiggling made a most successful job of what at first appeared to be almost impossible. The reason being that, undoubtedly, the jig reduced the area of plate heated by the pipe, and, while using a certain amount of force to hold the work together, did not use it in such a way as to put great stress on the weld when the job was finished.

I have done nearly 1,000 of these hemispheres and hardly ever got even a pin-hole, under test, and I have, on occasion, given the welds a severe hammering with a 7 lb. hammer before testing, without any ill effects.

Fig. 25 shows the jig in operation.

Fig. 26 shows a simple jig to overcome the ordinary welder's aversion to putting a thing on the right way round. This holds two lifting eyes in correct relation to each other.

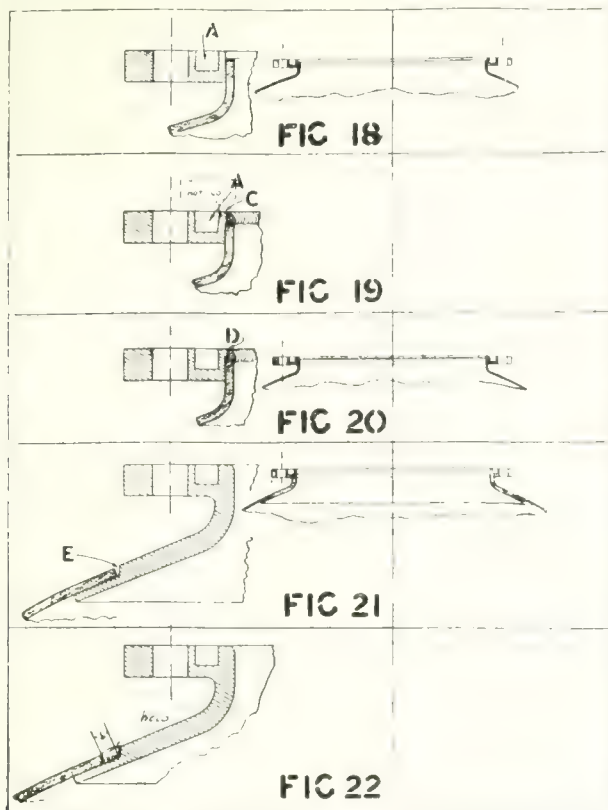
One frequently meets with such work as that shown in the photograph, Fig. 27, namely light sheet metal covers, $\frac{1}{8}$ inch thick, or less, welded to heavy flanges. This is always a difficult and somewhat unsatisfactory job to weld, but it is hard to see how to improve the design for welding without greatly increasing the cost of preparing the work. The difficulties are:

1. That the thin plate is overheated before the flange is brought to welding heat.

2. That welding along the inner edge causes shrinkage of this edge and consequent curvature of the flange.

A fairly satisfactory method of overcoming these difficulties is to heat along the outer edge of the flange with a larger blowpipe; this makes it possible to get a good weld without burning the thin plate, and to some extent counteracts the distortion, but even then some curvature takes place, and I have found it satisfactory to set straight flanges to a slight outward curve, before welding, and to make curved flanges of a somewhat larger radius. The amount of allowance to be made has to be found out by trial.

Everyone who has had to weld long longitudinal seams in sheet metal or plate, knows the difficulty of making the right allowance for the drawing together of the seam as welding proceeds, and also the difficulty of the edges of the



of these joints and had no complaint of defects after delivery, but I did slightly modify the design, as shown on Fig. 20.

By thickening the edge, as shown at D, Fig. 20, it can be freely melted without losing the face, and a better weld is made.

In the method of welding employed in Fig. 21, you will see that the hemisphere is shown lapped over the mouthpiece, which is a somewhat elaborate forging. The mouthpiece is machined at "E," to register into the hole in the hemisphere, with only 1-16 inch play. In a case of this kind, where one part is thick and one thin, this makes a very poor weld.

A concession was made allowing the hole in the hemisphere to be increased, and the joint was made as shown in Fig. 22, but this did not end the troubles. When the hemisphere was heated with the blowpipe, as might be expected, owing to its shape, it expanded outwards, and this not a matter of 1-32 inch or so, which would have been of no importance, but a matter of about $\frac{1}{4}$ inch. Even if clamped and tacked in six places, it lifted some 3-16 inch between tacks as welding proceeded.

Fig. 23 is a photograph of a section cut from one hemisphere which was clamped down in six places, by boiler screws, and shows the lift. On cooling, not only was the hemisphere distorted, but the bolt flange was buckled about $\frac{1}{8}$ inch from the flat. A heavy cast iron ring was bolted on with six bolts, and a further attempt was made, but

after the difficulties had been overcome.

The jig shown in Fig. 24 shows how the difficulties were overcome. It consists of a base plate, A, on legs, with a spindle, B, at the centre, and three columns C, at the outside. The supporting ring, D, on legs, is merely used to hold up the mouthpiece until the heavy cast iron ring, E, drops on spindle, B, which holds it true with the base plate, A, and the correct height therefrom. The hemisphere is then dropped over and kept concentric with the mouth by four blocks, G, on the base plate. Over the columns, C, is dropped a $\frac{5}{8}$ inch steel plate, H, with a chamfered hole at the centre, about $\frac{3}{4}$ inch larger in diameter than the hole in the hemisphere. This is tightly clamped down by the nuts on columns and prevents the hemisphere from rising off the mouthpiece.

The weld is completed while still clamped in the jig, when, by removing plate H and nut on spindle B, the hemisphere and mouthpiece can be removed with ring E still bolted on. The ring E is left on till cold. This almost entirely prevents distortion of the bolt flange of the mouthpieces from the flat. It was found that from nineteen to twenty-three thousandths of an inch shrinkage took place, in the diameter of the pitch circle of bolt holes and groove, and the diameter of the groove and holes had to be machined accordingly.

The plate H has the advantage of acting as a baffle plate, to keep the flame

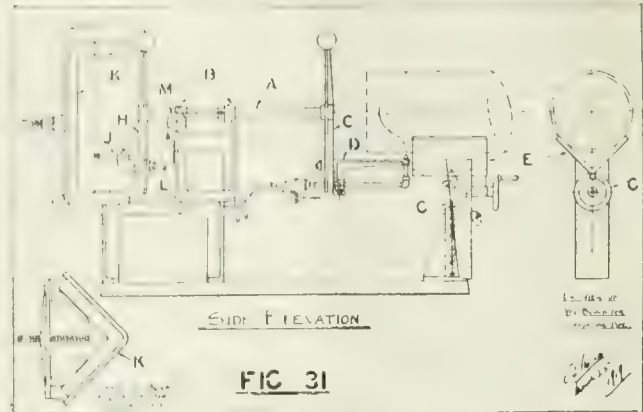
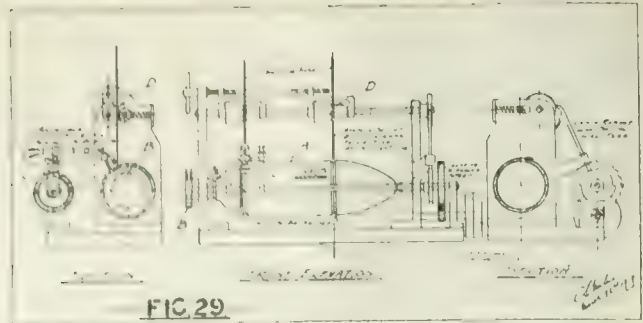
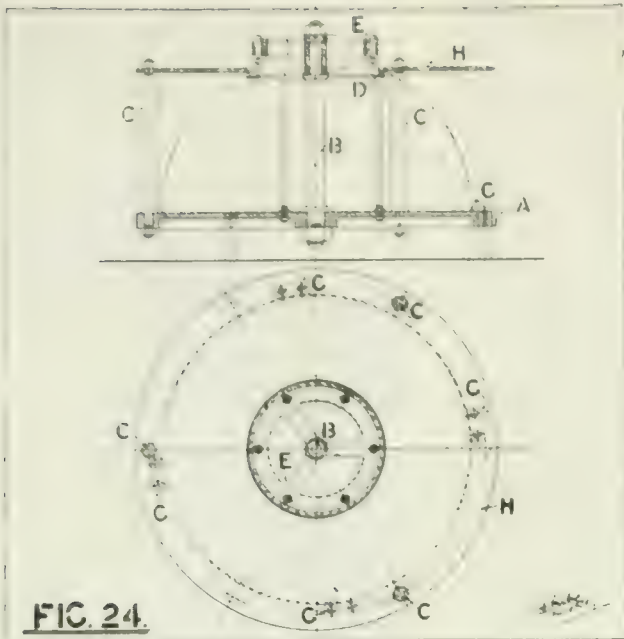


plate buckling, up or down, so that a perfect butt is not obtained.

Fig. 28 shows a very useful jig for overcoming this. It is a curved mandrel with a narrow hollow running down it. It is fitted with two clamps which can be swung aside to put the work in place, and afterwards tightened down by bolts at each end.

The joint comes over the hollow in the mandrel so that little heat is lost more quickly. When the clamps are sufficiently near the joint to keep it properly butted together.

The joint is left open the desired amount at the far end, and pulls together under the clamps. If it comes together too quickly the clamps can be tightened to restrain it, or, if the reverse, the clamps can be slightly loosened to allow the plate to come together more quickly. When the clamps are opened, as in the photograph, it makes a very useful mandrel for shaping up the work. I have these in various radii suitable for diameters from 5 inches up to 5 ft., and lengths up to 6 ft.

At one time during the war, the shortage of welders forced me to consider making an automatic welding machine, a matter which has been much neglected in this country. I was at the time considering the manufacture of $9\frac{1}{2}$ -inch trench mortar bombs, which were made of $\frac{3}{8}$ inch plate. The bomb is shown at "A," Fig. 29. It struck me that the two circumferential seams might possibly be welded, both at the same time, by machine.

I made an experimental machine for the purpose, and several trial welds were made showing considerable promise, but, owing to the order for the bombs not maturing, it was never perfected. I am hoping shortly to continue my investigations.

A slight explanation of the lines on which I worked may, however, be of interest.

The machine was operated by a belt

drive off the line shafting of the shop, and, through various gearing, turned the work, moved the blowpipe, and fed in the welding wire. The work was held in centres, and a ratchet "B" moved the work round, under the blowpipe, about 3-32 inch at regular intervals.

The blowpipe, through bevel gearing "C," was given a circular motion, making four revolutions to every forward movement of the work.

The wire was fed down into the weld by friction, between a V-shaped wheel "D" and cone-shaped roller, the object of the latter being to provide a variation of the rate of feed, by driving off the larger or smaller diameter on the cone. The cone was turned intermittently by a ratchet arrangement "E" which was adjustable.

The blowpipe was of the ordinary hand variety, but my experience led me to believe that a water cooled nozzle would be beneficial. The movement of the pipe was not altogether satisfactory, but with some modification I hope to be able to produce a serviceable machine.

Most of you are probably familiar with the type of cutting machine shown in Fig. 30, for cutting holes or circles in plates, and holes in tube, from $1\frac{1}{2}$ -inch diameter to 12-inch diameter. When cutting holes in a pipe, the blowpipe can be raised and lowered by means of the lever at the same time as it is turned, so that the nozzle can be kept at all times, the correct distance from the work.

I claim no novelty for this, but I do for that shown in Fig. 31. This is for cutting the ends of branch pipes to the correct form for fitting on to the main pipe.

It is a laborious business to set out on a drawing board the profile of branch

pipes, and, when a template has been made and the line marked on the pipe, it is still difficult to cut accurately to the mark. This machine, however, does the work automatically for any size branch pipe, up to 12-inch diameter, to fit any size main pipe, up to 12-inch diameter.

The method of operating is as follows:

"A" is a shaft which can turn and slide in bearings "B." The slide "C," keyed to this shaft, has a carrier "D" for cutting blowpipe. This carrier can be set at any desired distance from the centre of shaft "A."

The Vee block "E" carries the pipe which is to be cut, and can be raised and lowered, by means of screw and gear "G," so that, whatever the size of the pipe to be cut, it can be set concentric with the shaft "A."

The other end of the shaft "A" has got keyed to it a slide "H," fitted with a carrier for a former wheel "J," which can also be set at any desired distance from the centre of shaft "A."

"K" is a Vee block in which a short length of pipe can be clamped vertically.

If, for example, a 6-inch branch pipe has to be fitted to a 9-inch main, a piece of 9-inch pipe must be clamped in Vee block "K," and a piece of 6-inch pipe put on Vee block "E," which latter is then set concentric with shaft "A" and the cutting blowpipe set so that the nozzle is about $\frac{1}{4}$ -inch from the outside of the pipe.

The former wheel "J" is set by the scale on slide "H" to 3-inch radius (i.e., half the diameter of the pipe to be cut).

Now as shaft "A" can slide, as well as turn, and as it is attached to weight "L," by a wire running over a pulley "M," the former wheel "J" will be kept on to the pipe in Vee block "K," so that

when the shaft is revolved the blowpipe takes not only the circumferential movement but also the longitudinal movement imparted by the wheel "J," running on the curve of the pipe.

According to the size of the pipe, and radius on which the wheel "J" runs, the shape of the cut made by the blowpipe will vary.

Fig. 32 shows a cutting blowpipe guide which is particularly useful for bevelling the edges of plates, to prepare them for welding. For this purpose one wheel is flanged to run over the edge of the plate. It is also useful for many other purposes.

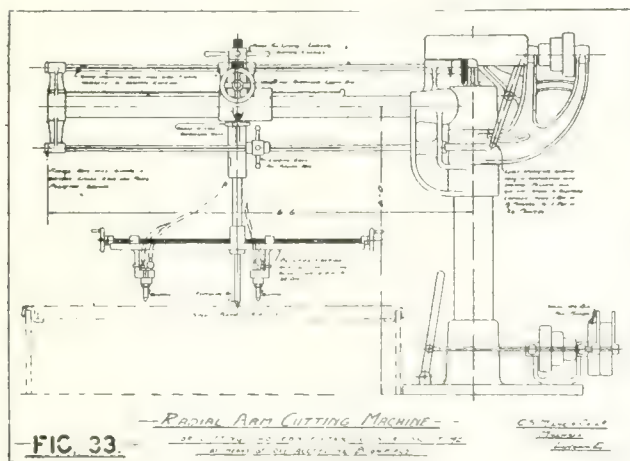
Fig. 33 is practically a radial drilling machine with the cutting blowpipe as a drill. By the combination of the three cones belt drive, and the special drive in the head, infinite variety of speed,

is cooling just at the moment when the part being welded is being made hotter.

Now with the charcoal fire the opposite takes place because the job can be welded while in the fire, and the draught set up by the blowpipe flame tends to fan the surrounding charcoal to a greater heat, thus evening up the heat on the surrounding casting.

If the casting is a large one, and only part of it wants to be heated (Fig. 34), the fire can be built round the part to be heated and, if desired, this fire can be moved with the casting, so that the work on all parts can be done in the most desirable position. Figs. 34, 35 and 36 show this.

The fracture being welded was the equivalent of a break, through "AA," in both sides of the frame, Fig. 34. It



between one revolution in $1\frac{1}{2}$ minutes and one revolution in 24 minutes can be obtained, and the speed can be varied by means of the lever while the machine is running.

It was designed for cutting flanges from plate 2 inches thick and upwards. It is fitted with two cutting heads to cut the inside and outside of the flange at one time. Provided the difference in radii is not too great, the slight loss of oxygen, from one cut not being made at its greatest speed, is more than compensated for by the time saved.

To revert to the subject of welding for a few moments, I should like to show one or two pictures of repair work in the process of execution.

In the case of repair work, and particularly of cast iron repairs, I am a great believer in charcoal fires for heating in order to reduce cooling stresses.

My objections to the muffle furnace are:

1. That, unless one specializes in one particular class of work, the jobs vary so much in size that frequently one cannot get them into a muffle.
2. That frequently it is neither useful nor advisable to heat the whole casting.
3. To my mind the most serious objection is that, as the work has to be drawn out of the muffle to be welded, the body of the casting

was lined up and clamped together and a sheet metal firebox was welded together round it. After the part which could be got at had been welded, it was turned on its side and the work continued as in Fig. 35, the box full of red hot charcoal going with it. It was then raised on its ends, as shown in Fig. 36, and completed.

In this way no chilling takes place during welding, and the weld can be done in the most favorable position. I personally have very little faith in vertical welding on cast iron, though in steel perfect work can be done, consequently I like to be able to turn the casting so as to work always on the flat.

Another example of partial heating is shown in Fig. 37. This wheel had to transmit 240 h.p. and, since the repair was made has been working for several years.

Possibly one or two lantern slides of other work may be of interest, if time permits, although this completes my "Examples of Jigs and Methods for Overcoming Distortion."

Company Gives Playground:—The Dominion Coal Company of Sydney, N.S., have donated a plot of ground to the city, which is to be used as a playground in summer, and an open-air rink in winter for the children of the district.

THE AUTOMOBILE TORPEDO

By M. E.

In 1868, the invention of the automobile torpedo by the English engineer, Whitehead, of Fiume, solved the problem of the submarine offensive in the most sudden and conclusive manner. Whitehead's success arose out of the failure of an enterprising Austrian officer, Captain Lupuis, who had been trying to steer a small fireship along the surface of the water by means of a rope from a fixed base either on shore or in a parent ship. The plan was a crude one, and was rejected by the Austrian naval authorities; it was then entrusted to Whitehead, who found it incapable of any practical realization. He was, however, impressed with Lupuis' beliefs in the value of a weapon which could be operated from a distance, and, though he failed in designing a controllable vessel, he conceived instead the idea of an automobile torpedo, and after two years' work, constructed it in a practical form. It has been spoken of as "the only invention that was perfect when devised," and it certainly came very near perfection at the first attempt; but it was erratic, and could not be made to keep its depth. In 1868, however, Whitehead invented the "balance chamber," which remedied these defects. The automobile torpedo was at first used only for the armament of ordinary warships; it was not until 1879 that an American engineer named Mortensen designed a submarine with a torpedo-tube in her bows. His example was followed by Berkeley and Hotchkiss in 1880, by Garret in his first Nordenfolt boat of 1881, and by Woodhouse and by Lagane in the same year. Even after this, Drzewiecke, Tuck and D'Allest designed their submarines without torpedo-tubes; but these were, in fact, indispensable, and the use of the Whitehead torpedo has been, for the last twenty years, assumed as the main function of all submarines designed for war.

HEAT TREATMENT OF STEEL

In a paper on the "Heat Treatment of Steel," read before the Society of Engineers, Mr. C. O. Bannister gives the following extracts from a book on trade secrets published in this country in 1583. "Take snayles and first drawn water of a red die, of which water, being taken in the first month of harvest when it raynes, boil it with the snayles, then heat your iron red-hot and quench it therein and it shall be as hard as steel. Ye may do the like with the blood of a man of XXX years of age and of a sanguine complexion, being of a merry nature and pleasant." Quenching mediums such as these were used for centuries, and in a book published as late as 1810 the worker was told to "take the roots of lilies, infuse it in wine and quench the steel in it, and the steel will be hard;" on the other hand, he was told that if he "takes the juice or water of common beans and quenches iron or steel in it, it will be as soft as lead."



WHAT OUR READERS THINK AND DO



We Start a Discussion on Another Subject

This Time It is a Reader Who Sends Us His Views on Parting Tools, Which We Believe Will Not Coincide With Those of All the readers of "Canadian Machinery"

DO start a discussion? Following this introduction, so to speak, we are publishing a talk on parting tools, which we submit to readers for discussion. As to our attitude in the matter, we say absolutely nothing—for the present, but afford readers the first chance to comment on the authors' views. After everyone interested has had their fling, we shall perhaps speak on the subject, except in the meantime some other correspondent voices our sentiments. This article is published without a change to the author's manuscript.

Now since we have cleared up our reason for publishing this article, let us hear from the author himself.

A TALK ON PARTING TOOLS

By Wm. Ernest

Who has not at some time or other seen or experienced the provocations peculiar to parting tools? The most peculiar thing in connection with parting off stock, is that the poor old lathe nearly always gets blamed. If it isn't a loose spindle it's a rickety, old compound rest, or probably a loose gib in the cross slide that is considered to be the cause of poor results.

Well, to make the whole story plain, let us first consider the ordinary forged parting tool. In the opinion of most mechanics this is the best style of cutting off tool. However this may even become very troublesome if the proper clearances are not obtained. A good blacksmith will draw one out so that very little grinding is required, but often too much is taken for granted that because a tool looks right, it must work right.

Now if the clearances are just right, but the bottom of the tool is bevelled off to a slight degree, it will be seen that the screw in the tool post will draw it down to that level and consequently tilt over the under side of the tool, thus causing it to drag and chatter and dig in. Thus, it will readily be seen that the bottom must be horizontal, with the clearance equal each side; then if the cutting

edge is wider than the back of the tool, and the front clearance not too much, even if the lathe spindle and other circumstances are rather unfavorable, once the tool is thrust into the work, and all slackness is taken up, the tool will peel cut nice shavings that make work pleasurable. To sum up briefly, "always see to it that the groove cut is lots wider than all except the extreme cutting edge."

The next tool to consider is the popular Armstrong parting tool holder with the blades held by a clamping screw. These tools have a bad habit of breaking, on account of not cutting their way clear. The makers claim that the good feature of this tool is that, when it breaks it is only the work of a minute to regrind and thus avoid delay. To my mind this is poor consolation, and to eliminate this tendency to break, I usually adopt the following method: First of all we know that the groove to be cut **MUST** be wider than the tool, therefore, an Armstrong parting tool must be widened slightly at the cutting point. It will be noticed that the blades are just soft enough to peen up if an ordinary hammer is used. I therefore tap the edge slightly and feel the increase in width between the thumb and finger. After this the edge must be touched up on an emery wheel and it is really surprising what a difference that few thousandths extra width makes.

In the operation of these tools; however, it will even be better to let the blacksmith upset the end slightly and then reharden. This extra trouble is well worth the while, for it will be found that a tool will work for a long time this way, and breakage is also reduced to practically nil. Finally, I would say that this is the only way that I would ever consider using the removable type of parting tool, and I would be very much interested to hear what luck others have with these tools.

What have you to say on this subject? Let us hear your views on the art of parting tools. All articles which we deem worthy of publication will be paid for at our regular rates, so get busy.

SPECIAL COMBINATION TOOL

Continued from July 3rd issue

By Robert Mawson

THE tool here described is used to overcome what was once a long and tedious machining operation, in fact a series of operations. This is the machining of a step for the spindle on a special machine. The manner in which this was formerly done was to first drill the hole to a predetermined depth, then turn the outside, afterwards face the end and machine a circular contour at the extreme outer end. It can readily be seen that when performing these operations singly there were many chances of error as each were independent of the other, not being controlled by any previously machined surface.

In the drawing is shown the casting and the special tool here described assembled. The work performed is drilling the hole A, facing the outside B and turning the concave surface C.

It will be noticed that two sizes of holes are to be drilled in the piece, which makes the operation more difficult. On the first tool made the drill was designed solid as shown by the detail D. It will be seen that this is made from a piece of high-speed steel with the end turned down to the correct length and diameter.

The trouble with this design is that there is no provision for either adjusting the position or length which is turned down after the end of the drill has been ground.

The new design E was therefore made to overcome these objections. This is made from two pieces of steel, one a stock drill .465 in diameter, which was slid into a reamed hole the same size in the body of the tool, which is .6875 in outside diameter. At the rear end of the drill is a tapped hole $\frac{1}{4}$ by 20 threads, and a headless set-screw is provided so that as the cutting edge of the drill is ground the inserted drill may be forced out by means of the screw to retain the .375 in. dimension. The tool was made with a concave groove on opposite

sides and a keyway machined at 45 deg. headless screw, one inch long, inserted in the shank.

The hollow mill used for the facing operation is shown at F. It will be seen that this element is made with three cutting teeth, and the back end counter-bored and reamed to 1½ inch. Three holes are drilled and tapped at the counterbored end, one for a ¼ inch 20 thread screw, and two of ⅜ inch 16 thread screws. A detail of the extension sleeve is illustrated at G. The element is turned down at one end to 1½ inch for a distance of 63 sixty-fourths of an inch, and a hole drilled and reamed to eleven-sixteenths of an inch for a length of 3 and three-sixteenths of an inch. The rear end is drilled and tapped for ⅜ inch 16 threads set-screw.

By referring to the side view it will be noticed that a slot is machined on one side for a distance of 1½ inch. There is also a No. 11 hole drilled, and a tapped hole ¼ inch 20 threads, these last two holes being 13 thirty-seconds of an inch off centre. The tool for forming the concave surface is shown at H.

It will be noticed that this element is made of square high-speed steel, the cutting end being machined with the

correct contour and clearance or rake ground on it.

When assembling the tool the drill E is placed in the extension G. The cutter H is then placed in the slot of the extension sleeve. The hollow mill F is afterwards placed over the extension sleeve.

The screw V is then screwed into the threaded hole of the hollow mill, the turned end fitting into one of the holes in the sleeve. An iron rod K, five-sixteenths of an inch diameter, and 2 and five-sixteenths inch long, is placed into the No. 11 drilled hole in the extension. A ¼ inch headless setscrew is placed at the rear of this rod and a ⅜ inch set-screw in the other tapped hole in the extension sleeve. A ¼ inch set-screw is also placed in the ¼ inch by 20 thread tapped hole in the hollow mill.

The tool is now ready for operation. The purpose of the two headless screws in the rear of the extension sleeve are for adjusting the drill and concave tools. The headless set-screw through the hollow mill is to hold securely the concave tool after it has been properly adjusted.

The ⅜ inch square-headed set-screw through the hollow mill and sleeve not

only hold these parts together but it will be noticed that the turned end comes against the drill, thus holding that element in position after it has been adjusted for position with the headless set-screw at the rear end. The grooves on the drill are for chip clearance, allowing them to pass away from the casting being machined and enabling more rapid and better results to be obtained. Some of the principles shown in this tool may be no doubt used for other pieces as this combination tool has proved a great success in operation, the pieces being machined being not only interchangeable but produced at a much more rapid rate than was ever possible by single operations under the best conditions. A further advantage is that a cheaper class of workman can be employed to use the tool as measuring and checking for each separate operation is avoided.

TO SHARPEN THE THREADS OF A SOLID DIE

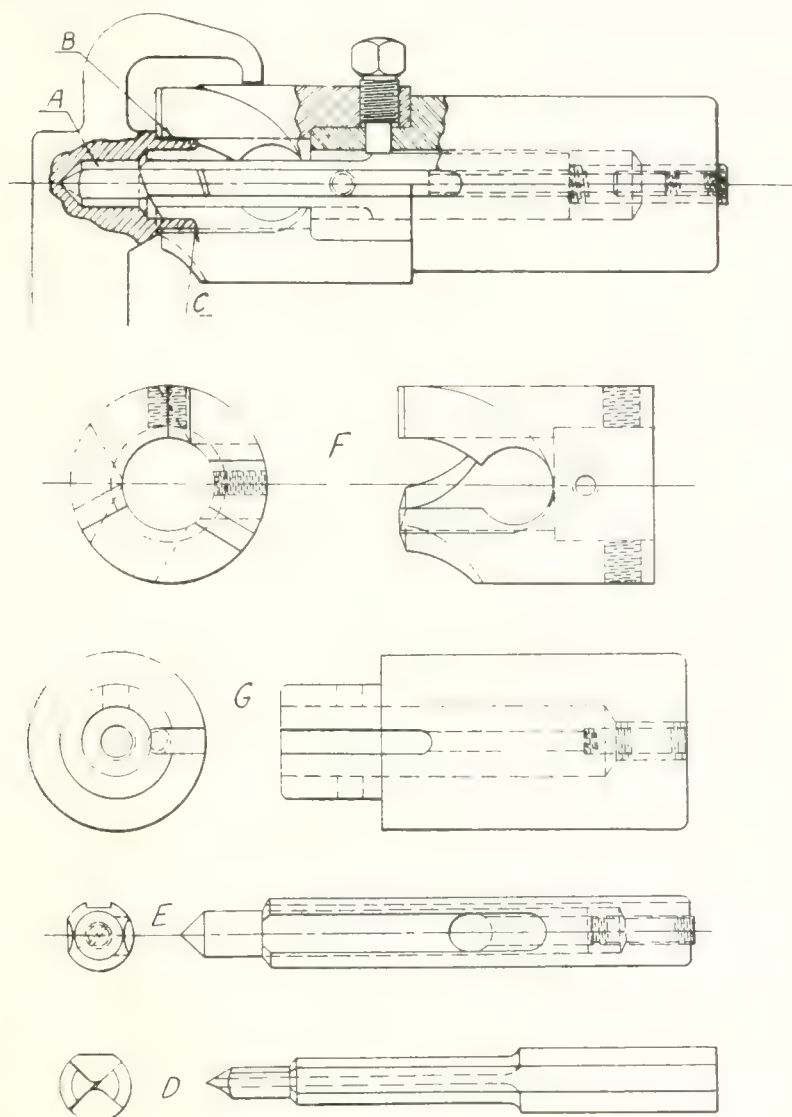
By H. J.

Solid dies are difficult to sharpen, because of the fact that the grinding wheel will not enter the cutting edges. If the dies are small they can be sharpened with a lap made of lead or wood, which is charged with emery. The lap can be revolved in the lathe, and the die worked back and forth on the lap. The proper angle will be ground, if the lap is a trifle smaller than the hole.

Selenium, an element analogous in some of its properties to sulphur which is obtained during the smelting and refining of copper, has had but little industrial application. Mr. H. A. Gardner, of the Paint Manufacturers' Association of the United States, has, however, prepared several pigments from it—the selenites of lead and borium, for instance—which are very white and of fine grain. Their exceptionally high refractive index gives them intense opacity. Other pigments of a closely related nature may be produced from beryllium. The oxide and similar products of zirconium have a very light degree of whiteness, opacity and permanence. From titanium many compounds have been produced, and it is probable that some day they may be used as pigments where great opacity and permanence are desired.

According to some investigations made in America on the best kinds of glasses for shielding the eyes of men working at furnaces, for protection from ultra-violet light, black, amber, green, greenish-yellow, and red glasses are efficient. Against the infra-red rays, deep black, yellowish-green, sage-green, bluish-green, and gold-plated glasses are best.

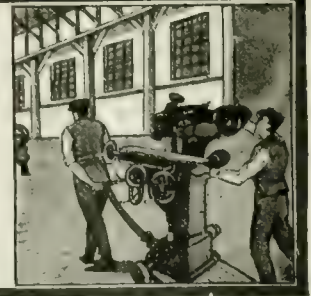
The Hudson Bay Railway.—At the recent session of parliament a sum of \$300,000 was voted for the purposes of Hudson Bay railway construction. A further amount of \$10,000,000 was passed for the government shipbuilding programme.



VARIOUS DETAILS OF THE TOOL.



DEVELOPMENTS IN SHOP EQUIPMENT



HEALD ROTARY SURFACE GRINDING MACHINE

THE 8 in. or No. 20 and 12 in. or No. 22 Rotary Surface Grinding Machines have been designed for manufacturing purposes and at the same time will give an extremely fine finish. They have been built massive, yet simple, having all the necessary mechanical refinements required to readily get various speeds and adjustments.

The wheel slide is a massive casting, having a flat and "V" way, which assures alignment at all times. The bearing surfaces are large and carefully protected from grit and dirt. Experience has proven that a downward pull of the spindle belt adds greatly to the rigidity and has been incorporated into the design of these machines.

The wheel guard is made separate from the wheel slide. It is not put on, however, in the usual manner, as it has the back face finished off to fit a finished surface on the wheel slide, making the two parts practically one. The advantage of this design is that if a customer should for any reason desire to use a larger wheel he will be able to do so.

The wheel spindle is large in diameter and made of chrome nickel steel. It is mounted in a straight plain adjustable bearing at the grinding wheel end. Adjustments for this bearing can be readily made through a hole in the top of the wheel slide provided for that purpose. This is the only adjustment required as the rear end of the spindle is mounted on ball bearings. A large sight feed oiler for the front bearing insures an ample supply of oil at all times.

The main drive bracket receives the

power from the main line by tight and loose pulleys and transmits it directly by belt to the main speed box, wheel spindle, and pump. The guard for the tight and loose pulleys is adjustable, so that the openings can be lined up for the belt. The shifter lever is arranged with a spring plunger which locks it in place in the off or on position.

The main speed box, which is situated on the rear of the machine, furnishes power to the wheel slide by a three-step

gears, one of which is mounted directly on the spindle. This spindle is mounted in a sleeve, which has vertical adjustments. The upper portion of the spindle rests in a taper bearing, while the lower end is equipped with ball bearing. With this design adjustment is never necessary, as the wear is automatically taken up. The chuck bracket is adjustable to allow for grinding of concave and convex surfaces to angles up to 10 degrees.

The feed to chuck is made by a hand wheel and vertical screw through a nut on the spindle sleeve. The machines are also equipped with automatic vertical adjustment to the chuck, which will feed from .0005 to .003 at each end of the wheel traverse.

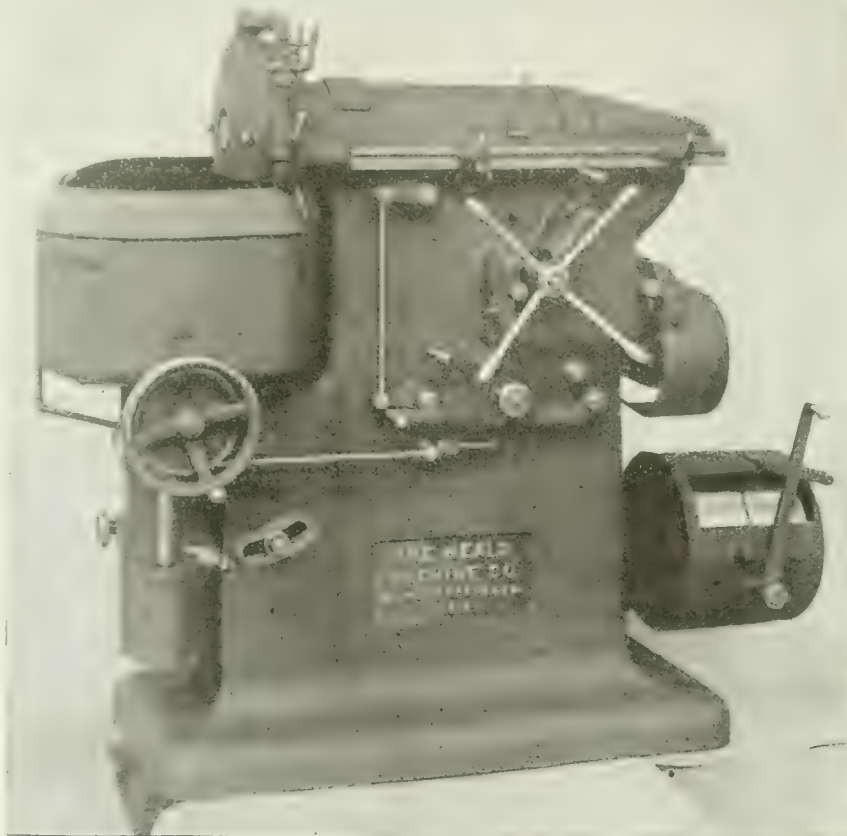
Water. The water equipment, including pump, tank, water-guard and connections, is regularly furnished with every machine. The tank is of unusual capacity, giving a most liberal volume of water, while a swivel joint in the distributing nozzle enables the operator to direct the flow at any desired point.

A Heald magnetic chuck, style 8 in. for No. 20, and style 12 in. for No. 22, are regular equipment. Three-jaw chucks or face plates with special fixtures may be substituted if desired or the work requires.

Motor driven machines can be furnished if necessary, the motor being placed where it is most convenient, on the floor, wall or ceiling, and belting directly to the main drive pulley. A few minor changes to the main speed bracket is all that is required when a machine is to be motor driven.

Specifications

12 inch.—

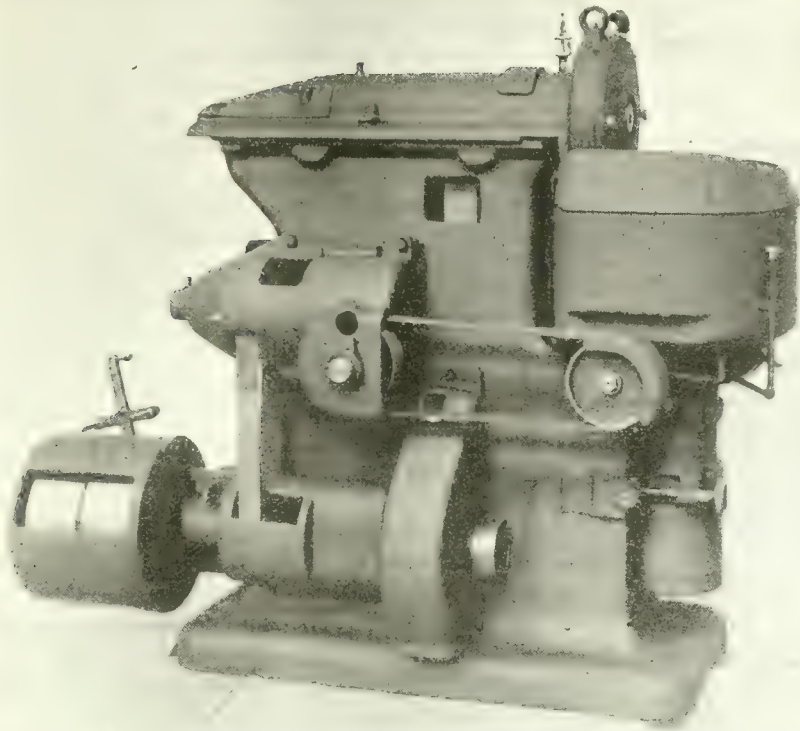


GENERAL VIEW OF THE MACHINE.

cone and three speeds to the chuck through a bank of gears. The speeds of wheel slide and chuck are independent of each other, allowing for a large latitude in regards speeds and feeds. The speeds to the chuck are controlled by a pull rod on the front of the machine.

All control levers and adjustments are within easy reach of the operator

The chuck spindle is driven by spiral



VIEW FROM OTHER SIDE OF MACHINE.

Diameter magnetic holding surface, standard chuck, 12 in. Face diameter, 13¾ in.

Size of grinding wheel, 12 in. diameter, 1¼ in. face, 5 in. hole.

Greatest distance, top of chuck to centre of wheel, 10 in.

Greatest distance between face of 12 in. diameter wheel and top of magnetic chuck, 4 in.

Smallest diameter grinding wheel, which may be used, 7½ inches.

Vertical adjustment of chuck, 5 in.

Largest swing inside of water pan, 16 in.

Floor space required, belt drive 48 in. x 70 in.

8 inch.—

Diameter magnetic holding surface, standard chuck, 8 in. Face diameter, 9¼ in.

Size of grinding wheel, 10 in. diameter, 1 in. face, 3½ in. hole.

Greatest distance, top of chuck to centre of wheel, 8½ in.

Greatest distance between face of 10 in. diameter wheel and top of magnetic chuck, 3½ in.

Smallest diameter grinding wheel which may be used, 6½ in.

Vertical adjustment of chuck, 5 in.

Largest swing inside of water pan, 13 in.

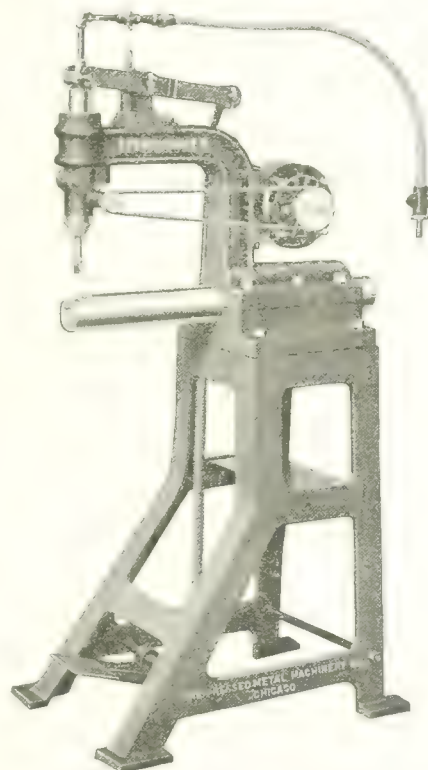
Floor space required, belt drive, 48 in. x 60 in.

SPINHAMMER FOR RIVETING

The accompanying illustration shows an improved type of riveting hammer developed by the Pressed Metal Machinery Co., 15 South Clinton Street, Chicago. This machine backs up the

action of a regular rotary rivet upsetting machine, with the quick yet positive and powerful blows of an air hammer, which is built into the machine.

The rivet is set by the air hammer—not by the operator; the operator simply feeds rivets and work to the machine and upon his depressing the treadle,



GENERAL VIEW OF HAMMER.

controlling the air valve, the hammer is thrown into action.

The rivet set or point is positively rotated by a self-contained ¼ h.p. motor, transmitting its power through a rawhide belt and worm gearing. The chuck for the rivet set is integral with the worm itself.

The hammer head always stops at the top of its stroke or travel, thereby facilitating the insertion and removal of the work without any interference. The stroke of the hammer is adjustable from 2½ in. down to ½ in. to suit varying lengths of rivets or depths of work. This adjustment can be instantly made by merely turning up or down the thumb nut in the top of the operating valve.

The speed of the machine can be varied by increasing or decreasing the air pressure—the higher the pressure, the faster the speed, and the more quickly can rivets be set.

All parts are made to operate under and withstand a line pressure of from 60 to 200 lbs. per square inch.

Unlike the clanging noise of the ordinary air hammer, this machine merely issues a low humming sound and that only when actually upsetting work.

Interchangeable riveting and spoke-heading fixtures can be used, the frame being arranged and the machine is equally well adaptable for one as for the other type of fixture.

The spinhammer operates equally as efficiently on one style of head as another, the speed with which the work can be set depending entirely upon the shape of the head and the amount of metal making up the rivet head.

RAISING SUNKEN VESSELS

For attaching wire hawsers to the hulls of sunken vessels where a diver cannot pass them under a new method called the limpet system is described. The limpet is a soft iron body, carrying a number of drill taps driven by small motors, the current being supplied from the salvage vessel. The limpet is lowered until it comes in contact with the hull of the vessel when it is magnetized, causing it to cling to the plates. The drills are then started, and after running a predetermined length of time the current is switched off, the limpet is hauled to the surface and the drills are left tightly fastened in the ship's hull. The ends of these drills are formed into eyes, to which the hawsers can be attached.

The method employed by the R34 to determine her position is one that discounts atmospheric conditions, and does away with the need of a horizon, artificial or otherwise. A moving pointer attached to the wireless instrument points to the direction that the signals are coming from. If the signals are being received from three stations set at wide angles on the earth's surface, the navigator has only to perform a simple triangulation to determine his exact position.

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Concerning Insurance

HAVE you enough insurance on your plant? Now this paper is not selling insurance, but the question is one that is prompted by knowledge of certain cases where losses have been incurred recently by the small amount of protection carried.

You have a good plant, worth hundreds and thousands. You probably reckoned the replacement cost when you put on the insurance and acted accordingly. Have you ever stopped to think what your replacement costs would be now? The buying price of machinery has doubled. Has your insurance kept pace? You say you are willing to take a chance and be covered on your initial investment. Well, that is your own affair, but there is a real situation here that cannot be overlooked.

A plant that has been in five or six years, bought at the prices that prevailed at that time, could not be replaced now for less than very close to one hundred per cent. increase. Just figure out everything, including transportation and labor costs, and see how far this statement is out.

If a fire should wipe your plant out to-night would your insurance policies, if they were all cashed, look nearly as large as when you took them out? The increase in costs has in reality amounted to a very serious shrinkage in the aggregate for protection. It is a point that should not be overlooked.

Using Power of the Tides

THE feasibility of securing a supply of electrical energy from the tidal waters in the coastal rivers of Britain is again being made the subject of close study. For some time this question has been approached more as an academic perennial than as a practical accomplishment.

Judging from figures that are now out there has been

a real move made. J. Smith & Co., engineers of Glasgow, have worked on the idea for years, and are well posted on all needful data. The river Severn at Pitshead, for instance, supplies (on paper as yet) 4,773,730 H.P. The Dee, in North Wales, at Point of Air, Manai Straits, and the river Mersey above Liverpool Docks—show a total of 5,651,984 H.P. It is claimed that by this scheme power could be generated and sold at a fraction of the present prices.

An explanatory guide to the tidal waters power scheme has been prepared by Mr. Smith, who points out that on all rising tides the head water runs through turbines into inside of weir; on all ebbing tides the water runs through turbines to outside of weir. All doors are closed at low water, keeping out the rising tide; also at high water, keeping in full tidal water. All rivers start turbines working at half tide rising or falling. This gives the half tide head for the working of the later half. There being about three hours between the time of high water at the weiring point in the Severn and the other rivers, this gives three hours' run for the Severn, starting at half rising tide—say, 17 ft. head—inside water being at low water and finishing at high water, 34 ft. minimum tide. The other rivers being now at half rising tide, they take over the working from the Severn until high water on their rivers.

The scheme has in view the furnishing not only of power, but of light to all the homes in Britain.

Perpetual Motion

EVERY so often someone who ought to know better, someone with engineering experience and training, brings forth some perpetual motion scheme, usually in its conception as old as the hills. Sometimes it is an electrically-heated boiler, steam engine and generator and sometimes a generator and motor, variations being rung in by juggling the speeds of the machines or having them different. Most of these false conceptions as to the availability of energy arise through its confusion with work.

Perpetual motion, as envisioned by its devotees, is distinct from the engineering principles often forming the basis of somewhat chimerical schemes for the utilization of the power inherent in wave motion or, as suggested by a correspondent writing to an American scientific paper, the utilization of the residual energy of tap water before it enters the sewer. Such things have as their basis some germ of engineering fact but fail through their application to things of little account.

Such is not the case with perpetual motion and anyone who has an idea, in its essence more foolish than the search for the philosopher's stone, transmitting base metals into gold, would be well advised to hie himself to a secluded corner and apply the principle of the conservation of energy to his own thoughts and to their misguided conceptions.

The nearest approach to a source of inexhaustible energy obtained without effort is found in the action of the radio-active elements, and in this case, enormous as is the store of intra-atomic energy and lengthy as is its life, it is not everlasting but slowly diminishes and is created at the expense of the radio-active element itself, the final product being lead of a slightly varying atomic weight.

Disappearance of the Old-Time Shop Joker

By J. H. MOORE, Associate Editor Canadian Machinery

WHILE much has been said and written about humor in the shop, it seems as if all the articles stop there and do not touch on the actual danger of such humor.

Recently the writer read an article in a machine journal which took rather a rise out of up-to-date toolmakers in general. It was stated that the toolmakers of to-day were far below the standard of 10 or 15 years ago. The author of this article even went so far as to state that old timers take a kindly interest when they see the newcomer trying to adjust his lathe to turn a taper, by prying over the rear end with a crowbar. How often does such an occasion arise?

He goes on to state that the old-timers, notwithstanding their propensity for practical joking, were a kindly, good-natured bunch, ready and willing to impart information, or render assistance where it was honestly and properly desired.

There is no denying the fact that the aforementioned old-timers were a kindly inclined bunch, and willing to aid the apprentice—but regarding the practical joking—did they step over the boundary line, and often cease to be funny—and just plumb foolish?

For example, it is hardly a year ago since some old-timers put it into some boys' heads that compressed air was a dandy thing to play pranks with. To make a long story short, they placed the hose in one boy, turned on the pressure, and soon there was one boy less in the world. Readers might well say, the fools ought to have known better, but the fact remains that they didn't. This is one example of misplaced humor.

The writer personally played a rather good (?) prank, one first of April some years ago.

It was his habit to eat chocolates practically every day, which made it easier for him to carry out his intention. This morning in question, he was chewing candy as usual, and passed round the bag as per the regular custom. Each member of the staff thanked the writer and indulged. Some, on biting into their chocolate, received a surprise in the shape of a piece of .Surprise soap, others got red pepper centres. The master mechanic received a candy with a marble centre, and almost choked himself. The writer came very close to getting fired, which would have served him right, for it was another case of misplaced humor. Work for that morning was, to say the least, disorganized in this particular department.

Then there is the boy who will persist in placing a pin or thumbtack on your chair in the drawing office. Usually you merely jump and roundly curse the lad, but one case which came to the writer's attention resulted in a rather serious illness later on, through this simple prank.

There is another form of humor, much to be regretted, namely, monkeying with electricity. Monkeying is the correct term, for monkeys, as a rule, are always up to some prank or other.

Here are two examples. "Go on down and get me a pint of amps," were the instructions issued by a workman to a new apprentice not so long ago. Off went the green hand complacently, and luckily went to the chief with his request. This chief had risen to position of chief through his ability to stick to business in business hours, so without delay he made all concerned understand that humor such as this was strictly prohibited.

Suppose some other irresponsible workman had received this apprentice's request, there is no telling what the result might have been.

The second illustration started so simply and ended with a totally unlooked-for finish.

Did you ever take a lamp and socket, and, holding the globe carefully, place the brass socket near to a wide, fast-running belt? The result, of course, is that you store in the socket an enormous amount of static electricity. You then hand the socket to some unsuspecting individual, with the result that he emits a shriek, and drops the socket as he would a red-hot coal. Sometimes the kick in the socket is something fierce.

In this case in point the chap who was handed the socket received such a shock that he fainted, fell up against a moving piece of machinery and was rather badly smashed. It was some six weeks before he was able for his work. Of course this incident sobered up all concerned, but still it was another example of misplaced humor.

It often happens that accidentally a good joke occurs. This is, in the writer's opinion, true humor and worthy of a laugh—that is after it is all over.

The incident in mind is one which occurred years ago when the writer was serving his time at the machinist trade. There was a rather quiet chap working alongside the writer on a lathe of similar make to his own. Suddenly one day when this fellow was leaning over his work he let out a yell, a horrible yell, in fact. It looked to the writer as if this chap was caught by the overalls, so he rushed and shut off the motor, but still the yells kept on. Suddenly like a flash the solution came to all the fellows now gathered around. One of them went and shut off the light switch which made everything O.K. once more, for this was the whole trouble. This chap's shoes were wet and he was standing on a steel plate, had his one hand on the lathe bed, the other on the wire lamp shield, which was not properly insulated. Of course the result was a severe shock. We all had a good laugh—but not until it was all over.

And now, as they say in the movies—comes the close-up. This same chap was working industriously away one day, when someone, trying to be funny, hit him behind the joints of the knee with a board. Of course he jumped, but in jumping got caught in the job which was being turned. It was his arm that caught, with the result that it was broken.

Which of the two cases is true humor?

Last but not least, another little tale which looked harmless, and was harmless in the shop, but very much otherwise outside the plant.

This fellow had just come over, as they say, about the newly-arrived from the Old Country. He dropped in this morning, asked for a job, admitted he was not a machinist, but knew what a drill press looked like. The foreman took him on as he needed a drill hand immediately.

The new hand started work, but his drill was none too good, and off he went to sharpen it. Here was our opportunity, so we crossed his belt on him before he returned.

In went the newly-sharpened drill, down went the hand feed lever, but horrible to state, the drill refused to drill. There was a sort of worried expression on the new hand's face, but he decided he could not have sharpened the drill correctly, so back he went. He returned but with the same result. To make a long story short, he did this about 4 times, without discovering the trouble. In the midst of his earnest search after the difficulty, the foreman dropped around to see how he was getting along. It didn't take very long for the foreman to size up the situation, with the result that the man put on his coat and hat.

Continued on page 56

Worth-While Information From Many Points

If equal parts of copper and antimony are melted together it forms an alloy of a beautiful violet color, which takes a nice polish, but, being too hard for many purposes, a substitute can be produced by taking an iron casting and copper plating it, after which immerse it for a moment in a solution containing antimony.

August 25th of this year is the centenary of the close of James Watt's life. At a meeting of the engineers of Birmingham (the city of his adoption) it has been decided to erect a James Watt Memorial Building to serve as a museum, and also to endow a professorship of engineering, to be known as the James Watt chair, at the University of Birmingham, for the promotion of research in the fundamental principles underlying the production of power and the study of the conservation of the natural sources of energy.

Where great power is applied slowly, particularly when space is at a premium, the worm-and-wheel drive is seen at its best. Another advantage of this type of drive is the ease with which it can be kept oiled. Perhaps greased would be a better term because the worm frequently works in grease. The whole drive is usually enclosed in a grease-tight box, though which passes the driving shaft.

Belts form a very important part of the equipment of factories—a part of equipment that is habitually used, however, in most inefficient and wasteful manner. There are exceptions, notably in connection with the more modern machinery. But many belts are running at an average speed of nearer 1,000 than 4,000 or 4,500 feet a minute. As a result six-inch belts are used where one-and-a-half or two-inch belts would be not only much cheaper in first cost but also much better. Bearing pressures are materially lessened, while friction and the accompanying wear and power consumption are reduced. This tends to conserve leather, fuel and oil, and lower repair expense.

In a certain plant the technical magazines which are received are first read by the engineers in the office. They are then placed in a box made especially for this purpose, at the employees' entrance. Any worker may take one at a time home, and after reading it, return it to the box so that other employees may read it. This scheme is worthy of more general application.

It is not generally known that sea lions played a most important part in sea warfare. The British Admiralty used these animals to hunt U boats. First the animal is trained to follow sounds from the water's depth. After graduation it is put overboard whenever U boats are believed to be in the vicinity

of the ship. These animals proved a decided success and well worth the trouble spent in training.

Now comes the long-spouted oil can for lubricating revolving shafting, without going up to the danger zone. You merely stand on the floor, place this special oil can in position, press a button and out comes the oil. The inventor if this new can claims that dozens if not hundreds of lives will be saved with his device.

The annual output of thirteen billion gallons of petroleum in the United States consists of 1,800,000,000 gallons of kerosene and about twice as much gasoline, the remainder being gas oil, distillate and light and heavy residuals.

Salonika will become one of the most important ports of the near East if improvements started by the Greek Government are carried out. Expenditures of \$100,000,000 are planned, and include a city water supply, drainage and sewer works, dock extensions, railway stations and underground railways, 100 miles of new streets with housing developments, theatres, etc.

It is anticipated that German railway systems will find great difficulty in rebuilding their lines to pre-war standards, and that cheaper construction will have to be used, both on account of scarcity of raw materials and also financial difficulties.

When a steel article with a metallic coating is scratched or abraded so that a small area of steel is exposed, the two metals will, in the presence of atmospheric moisture, form a galvanic couple or cells in which a current will be set up. The metal, which is electro-positive to the other, will be oxidized, while the electro-negative metal will remain uncorroded. When the coating is zinc, it is the zinc which will be oxidized. If, however, the coating be tin, which is electro-negative to iron, the steel will be attacked. Therefore tin as a protective coating is useful only so long as the coating remains everywhere continuous. Aluminum makes a good protective coating for steel. In the method called calorizing the metal object is placed in a mixture containing aluminum and heated up to 900 to 950 degs. C. By this means a coating of aluminum which penetrates into the iron is obtained.

In Canada the developed water power is estimated at 1,735,598 h.p., while the power available is placed at 18,803,000 h.p.

In the Great War some of the losses in killed were as follows: Russia, 1,700,000; France, 1,385,000; British Empire, 692,000; Germany, 1,611,104; Austro-Hungary, 800,000; Turkey, 300,000; Italy, 460,000; Serbia, 320,000; United States, 67,813.

The Dominion of Canada, since the

beginning of the war, borrowed from the Canadian people no less than \$1,436,000,000. This amounts to \$192 per capita of population.

H. L. Van Keuren, chief of the gauge section, U.S. Bureau of Standards, says that any workman, with a glass true plane and light, can measure accurately to the millionth of an inch.

Figures have been given out showing the way in which costs of running the British railways have been mounting up. The present estimate of increased cost in working the railways during the financial year ending March 31, 1920, as compared with 1913, was from 104 to 109 millions, made up of war wages and other concessions, 57 millions; 8-hour day and new concessions recently gratified or still under discussion, 20 to 25 millions; and extra cost of materials and coal, 27 millions.

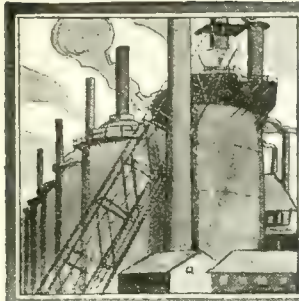
On one occasion last year the Westminster clock showed the wrong time to the extent of three seconds, but the error was less than a second on 151 days. The clock is checked but not corrected daily. The time ball at Devonport was correct to within a second throughout the year; that at Portsmouth was out of time to the extent of from one-half to one second on two occasions, and the Portland ball was incorrect to a similar extent on four occasions.

Corrugated iron huts, measuring 30 ft. by 15 ft., at £40 each, are one of the features in "Surplus," the second number of which has just been issued by the British War Office. The publication has been extended considerably, and many of the materials are now listed according to the county where they are situated. The Ministry announces that this paper, "Surplus," is issued to catalogue the left over and surplus war material.

The Nova Scotia Government is to create a hydro-electric commission similar to that in Ontario. Two bills, one to authorize the development of water power and the other to lay down regulations covering water and water courses, have been introduced in the Provincial Legislature.

The proposed extension of the water main to Moose Jaw, Sask. Con., will entail laying a pipe line about 70 miles long. The pipe will be of wood and 24 in. in diameter. The relative costs of wood, steel, and cast iron pipe for the work are in the proportion of 2.3, 5.7 and 10.5.

A. R. Roberts, formerly of Burns & Roberts, Ltd., Toronto, has discontinued his connection with the firm, and has opened an office at 201 Bank of Hamilton Building, Toronto. He will deal in new and used machinery, contractors railway and power plant equipment.



MARKET DEVELOPMENTS



Waiting for Period of Big Buying in Canada

Firms in This Country Still Buy Largely for Immediate Needs—
Several Changes in Prices—Copper Stronger and Looks Like
More Advance

THERE is a real and a noticeable improvement in the business going to the larger steel mills of U.S., and this is almost certain to be reflected at the Canadian mills and in business in general. The trade is discussing the new contract made between the Dominion Government and the Dominion Steel Corporation, and the opinion does not seem to be favored that steel at the price named, 3.65, can compete in this district. Taking Toronto as a given point, the Sydney plate would be 4.20 per pound, while Pittsburgh would lay it down here for 2.92½, plus exchange, leaving a margin too great to be discounted or ignored.

Speaking of plate, it is reported that a good tonnage was placed this week by the National Railways.

Buying is not improving as it had been hoped it would. Before the war there were plenty of concerns in Canada who made up an order covering many lines, such as plate, tubes, iron, bars, etc., that would be enough for an or-

inary year's operations. Now most of these companies are buying for immediate wants only, and as a result business dribbles along and the mills do not get the much-wanted big tonnage orders.

Makers of some lines of machinery have served notices of advance. This is for material not much used in war work, and which has not risen far past pre-war prices. Against this, chain prices are eased off to the extent of \$20 per ton. Chain did not come down immediately following the war, and the present reductions are practically delayed concessions.

The metal market is strong. Copper, it is anticipated, is in for a fairly well-continued session on high levels. Copper went very much to pieces directly after the war, but has been coming steadily back ever since. It is well above pre-war levels. Copper on the 31st of July, 1914, a day or so before the war, was quoted at 13, while the latest figure at New York names 23½c. The tendency is still up.

PITTSBURGH REPORTS THAT BUSINESS IS IMPROVING IN REAL EARNEST

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 17.—The report of steel ingot production in June makes an even more favorable showing than was expected. All observers recognize that there was much better mill operation in June than in May. With increasing operations during the month, even at the close of June few mills estimated their operations at over 70 per cent. of capacity, and as May had shown an average operation of 54 per cent., a fairer estimate for June appeared to be about 60 per cent. The official report since made, however, indicates an operation during June averaging 67 per cent. of capacity. The first four months of the year showed rates as follows: January, 87 per cent.; February, 85 per cent.; March, 77 per cent.; April, 65 per cent.

A little analysis of these figures will indicate how great an improvement there has been. It will be observed that the 54 per cent. average for May was far below the rates for April or June, and thus it is clear that at about the middle of May the rate must have been lower, probably not over 50 per cent. On the other hand, with production

steadily increasing during June, and an average of 67 per cent. for the whole month, the rate at the close of the month must have been about 70 per cent. Accordingly there was a rate of about 50 per cent. at the middle of May and a rate of about 70 per cent. at the end of June, only a month and a half later, showing an increase in tonnage output of 40 per cent. in that short space of time.

The computation of percentages of operation are based on the monthly reports of the American Iron and Steel Institute, giving the output of 30 companies which in 1918 produced 84.03 per cent. of the total steel ingot output. The production of the 30 companies was 2,219,219 gross tons in June against 1,929,024 tons in May.

Production for the first six months of the year was at the average rate of 35,500,000 gross tons a year, for the whole industry, or at about 72.4 per cent. of capacity, which can be estimated at 49,000,000 tons a year.

Steel Corporation Business

The monthly report of unfilled obliga-

tions of the Steel Corporation shows that in June there was more contracting for forward deliveries of steel products than was reported at the time. It was well known that there was a continuous increase in the booking of actual shipping orders, comprising specifications against contracts together with new orders, specifications attached, but it was not supposed that there was much contracting for forward deliveries. For months there had been practically none at all, and some sales agents were remarking that they had forgotten how to fill out contracts, as the business received was all in the form of shipping orders.

The Steel Corporation report, however, showed 4,892,355 tons of unfilled obligations at the close of business, June 30, this including contract obligations as well as shipping orders. The increase during June was no less than 610,545 tons, whereas each of the preceding six months, beginning with December, had shown a large decrease, these decreases averaging 640,000 tons a month. These monthly reports are not a reflection of the rate of booking orders on which the mills actually operate. A month may begin with a certain volume of unfilled obligations and the mill may ship heavily, merely upon specifications against the contracts, whereby at the end of the month the unfilled obliga-

tions would be found to be decreased by the volume of the tonnage shipped. On the other hand a mill might book a large volume of contract business in a month but have very little tonnage of shipping orders on which to operate. Thus the main thing the Steel Corporation report shows is that contracting in steel products is now in vogue again.

Lake Ore Movement

Shipments of iron ore down the lakes in June amounted to 7,389,832 tons, against 9,921,860 tons in June a year ago. The season total to July 1 is 16,048,132 tons against 18,042,740 tons for last year's season up to July 1. While there is a falling off of 2,940,000 tons the showing as to trade prospects is by no means unfavorable for the reason that there has been a large surplus of ore to liquidate. Last year's ore shipments were sufficient to carry the blast furnaces with full supplies up to about June 1 of this year, but as the war ended the production of pig iron declined very materially and not as much ore was used as had been provided. Indeed, the ore movement up to July 1 was almost wholly by the producer-consumer class, very little merchant ore being moved because the furnace interests that buy ore had not taken hold as to purchases for the season. Some had declared that they would not buy until about August 1, expecting the market to decline. Several weeks ago it became evident that ore prices would be held strictly and so there has been buying in a moderate way in the past two or three weeks, and the ore movement for the remainder of the season will probably show a picking up. The basis price for the season is \$5.55, for Mesabi non-Bessemer ore at Lake Erie dock. An advance of 25c went into effect Oct. 21, 1918, under the auspices of the War Industries Board, making the price \$5.75, but there is a 20c reduction for this year due to the lake carrying rate declining from \$1 to 80 cents.

Railroad Buying

One of the chief things the steel industry now needs is a fair volume of railroad buying. Some departments of the finished steel trade that do not make materials used by the railroads are doing very well, while the branches that furnish railroad material are at the bottom of the list in point of activity. About three weeks ago it was reported in the inner circles that the Railroad Administration was about to place orders for 300,000 tons of rails, but nothing has come of this to date. It is surmised that possibly the Railroad Administration sees its way clear to returning almost complete control of the railroads to their owners at an earlier time than expected, though of course the earnings guarantee will run to the end of this year in any event. Thus it may be that the individual railroads will soon be in a position to place orders on their own initiative and responsibility. Another thing the steel industry needs is more construction work by way of large jobs, including bridges, large build-

POINTS IN WEEK'S MARKETING NOTES

A Belgian concern has purchased practically all the machine tools that were left on the American market. The price was based on 1914 figures in many cases.

There has been a very decided improvement in the purchasing of steel, according to reports from Pittsburgh.

Prices on chain were marked down to-day 1c per pound or \$20 per ton on electric and proof coil.

Some machine-tool makers are announcing increased prices on lines that were not much inflated during the war.

Dealers state that plate made at Sydney at 3.65 cannot compete in the country for business. In Toronto, for instance, the price would be 4.20 against 2.92½ for U. S. plate.

Very little improvement is to be noted in the amount of buying going on. It is still on a small basis, purchases being confined to needs.

ings, factories, etc. The erection of dwelling houses promises to be heavy the remainder of the year, judging by reports from various centres, and the fact that the nail departments of the wire mills are practically filled up for the next two or three months is concrete evidence of this activity, but that does not help the structural mills, which have a very light operation, in keeping with the rail and plate mills.

Pig Iron Moving

The pig iron buying movement is not altogether over, as it was thought at the end of June it might be. While there has not been much activity in the past week or two there has been some, and with the furnaces now in operation well filled for the third quarter, some of them practically through the year, the market is quite steady. Predictions of price advances in the near future do not seem to be well timed, however, as when idle furnaces see improving business ahead they generally hasten to get in to blast and they are not very particular as to the prices obtained by the "back log" business they generally take before they blow in. Rarely does a furnace blow in to make up stock.

Mr. Robert K. Newton, formerly assistant manager of sales at Brown's Copper and Brass Rolling Mills, New Toronto, Ont., was appointed to the position of general sales manager on July 1.

Canadian Plate Will Be Too High

That is Opinion of Some of the Dealers
—Market Doing a Fair Summer
Trade

Toronto.—There is not a very large amount of business going this week, although some of the firms that have been in the market for equipment are still taking on material.

Inquiries are numerous, in fact there is a lot of business to be converted into cash, and it will surely be coming into the market in the not distant future.

Notice of Increases

Reference has been made in these columns several times to indications of higher prices for machine tools. Just how this will affect the sales is somewhat of a guess, and there seems to be a sharp difference on the advisability of such a move at the moment. Machinery is still on a high level, and any additions that are made will cause the purchaser to look rather hard at used equipment that may be on the market. Cochrane-Bly are out now with an announcement of a 20 per cent. increase on universal shapers, cold sawing equipment, etc., the raise running from 7½ to 20 per cent. It should be added that these machines did not increase much in price during the war, and even yet are much nearer old prices than many other lines that went up much and came down little.

The automobile business is the best anchor at present when it comes to real business. There has been a lot of buying done by the automobile interests, and there is going to be a lot more done. The making of differentials, with a heat treating plant, has been closed for the Willys-Overland people.

Dealers are inclined to be a little disappointed at the amount of business they are securing from the railroads. The National Railways have been out on several occasions with large lists, but they have not resulted in the placing of a very large amount of new business. For instance a Bullard boring mill is called for now, and the price will be around \$8,500. Not so very long ago the purchase of one of these machines was urged at \$6,500, it being in first-class shape, only running in a war shop for two months. The matter was delayed too long at the time, and the new machine will have to be bought now. Of course the machine tool salesman should not be particularly worried over the prospect of selling a brand new boring mill.

The railways are asking for bids on other lists just now too.

The Steel Trade

There are little pockets in the market that bring forth queer happenings. For instance a few days ago one dealer brought out a car lot of black sheets and offered them to warehouse interests for less than the Pittsburgh price to-day. He was rather out of that line now and anxious to unload. The same things hap-

pen at the mills now and then. Some interest comes to the top and takes a flyer into the market with the idea of hunting up a little added tonnage for immediate working. However, these things have always been in the market, and always will be, and they in no way touch the stable tone of the transactions.

The fact is, and it does not take much looking to discern it, that the market is even stronger than the prices indicate. Buying is not improving as it had been hoped for. There is still the policy of dribbling. Some years ago a firm would make up a list covering its requirements in plate, tubes, iron, bars, etc. The sales agent would have a trip and a good busy session. He would either get the year's business in a lump or he would lose it. Now these same places are nearly all buying in small lots.

There is a new price out on proof coil and electric weld chains which shows a reduction all round of one cent per lb. The reason is that chain did not come down along with other lines after the war. In fact it stood pat during the several reductions that were announced in steel.

The New Plate Mill

"Will there be any chance of the plate that is rolled at Sydney, under the new contract, coming into the market here as a competitor at a price?" asked MACHINERY of one of the big selling organizations this morning.

"Absolutely no," was the very emphatic reply. "The price is still away

high. If they are going to pay 3.65 per pound for plate, they cannot compete for the business that is passing here. Plate from U. S. mills can be laid down in Toronto at 2.92½, while plate from Sydney at 3.65 would cost a good 4.29 when landed here. Of course Montreal would get a closer rate, but even that would not help matters."

The Scrap Market

A good amount of business is going through the scrap yards at present, and buying is fairly liberal, but prices are staying about where they have been for some weeks. There is more material coming on the market now than for some time past, and shipments out are correspondingly larger. Some misunderstanding is noticed in Montreal and Toronto quotations, owing to the higher figure for Montreal. Montreal is not only a consuming point, but its quotations are based on gross tons, against the net tons meant in the Toronto quotations.

Copper Market Strong

New strength is evident in the copper market, and prices are coming along showing decided evidence of increased strength. The copper prices have mounted well above pre-war figures. Electrolytic is quoted now at 23½, against 18 cents on July 31, 1914, a few days before the start of the war. Production costs are higher, of course, and there is going to be a tremendous demand for copper in many sections of the world.

current volume of business. Coppers are again marked up one cent per lb., the quotations being 24 cents for lake and 23 cents per lb. for electro and castings. Spelter is in better demand and prices have advanced to 9½ cents per lb., this quotation being one cent higher than last week. Other metals are nominally firm on light, but steady demand.

Machine Tools Still Quiet

One is at a loss these days to state, definitely, the actual condition in the machine tool industry. Some dealers report a fair volume of business, while others state that nothing is coming in. On the whole, it would appear that, apart from the sales on used equipment, the activity in machinery is confined to the requirements of a few new developments and for railroad purposes. The general demand is undoubtedly quiet. Inquiry is still of a character that might imply early buying, but apparently few of such inquiries have ripened to the point of purchase.

Scrap Remains Unchanged

While there appears to be a little hesitation about holding prices at their present level, the dealers here are reluctant at making reductions this week. Business has been fair during the past few days, and while some appear to incline to lower quotations, no definite action is yet noted. However, it would not be unexpected to see some changes next week. Coppers are quite firm, but other metals and steel scraps are developing an easier tendency.

MUCH BETTER FEELING NOTICED IN THE MONTREAL TRADE OF LATE

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 17.—There is an undoubted improvement in the tone of the general situation, and while actual business has shown no marked increase, there is nevertheless a better feeling prevailing in trade circles. The announcement that the Government has renewed the contract with the Dominion Steel Corporation, at an adjusted figure, has had the effect of reassuring the steel interests of the continuance of shipbuilding and other activities for an extended period. The large plate mill at Sydney, the construction of which was suspended several months ago, will now be rushed to completion, and actual production of plates will be possible early next year. The strike situation is less pronounced and many settlements have been made or are pending. Shipworkers at Canadian Vickers will, probably, be all back to work this week. Business in and about the harbor is very active and every vessel leaving port goes out with a full cargo, the greater portion of which is food supplies and lumber. Steel merchants in this district report little change as a result of the signing of peace, but are hopeful of better business developing before the summer closes. The metal market is firm and

the demand is slowly but steadily increasing. Business in machine tools is largely on used equipment. Old materials have been fairly active and firmness is maintained.

Metal Improvement Holds

The improvement that has been noted in the metal market during the past few weeks appears to be holding its own, and while the volume of sales may not denote a buying movement, there seems to be a more confident feeling expressed on the part of the consumer and sales are more regular. Small quantities are still the feature and trading does not show any great tendency on the part of the purchaser to carry supplies other than those required for immediate or early operations. It is believed that Germany will soon place large copper orders with the States, and this will be an influential factor in maintaining a strong market. It is reported that American supplies on hand are steadily decreasing, and as mining and refining are somewhat disorganized, as a result of shutdowns, some little difficulty may be experienced in securing labor for this industry. The movement here is not heavy, but it is of a steady character, and dealers are quite satisfied with the

Machinery Exhibition.—The Right Honorable Lord Weir of Eastwood, has promised to open the Shipping, Engineering and Machinery Exhibition at Olympia, England, on September 25th next. This exhibition, of which Sir Owen Phillips, G.C.M.G., M.P., is hon. president, Sir Archibald Denny, bart., chairman of the Committee of Experts, and Mr. F. W. Bridges, secretary and organizing manager, and which was to have been held in the autumn of 1914, but in common with other important events, had to be postponed on account of the war, will afford the general public an opportunity of becoming acquainted with the luxury, comfort and ease of present-day sea travel. The interval which has since elapsed has, moreover, afforded British engineers an opportunity of introducing vast improvements in connection with marine and general engineering, with the result that Olympia will be full to overflowing with machinery and appliances of intense interest to all concerned with the shipping, shipbuilding and engineering industry, and the exclusion of everything of enemy origin will enable the British public to see how absolutely independent we can be of anything produced in enemy countries, at any rate, as regards this particular industry. The exhibition is to remain open for three weeks.

BELGIAN CONCERN IS REPORTED TO HAVE BOUGHT UP U.S. WAR MACHINES

Special to CANADIAN MACHINERY.

New York, July 17.—Recent newspaper reports from Europe that the United States Army has sold all of its used machine tools abroad to La Construction de Metalbique de Belgique, a Belgian manufacturing concern, is confirmed by Secretary of War Newton D. Baker. Machine tool builders who had been opposing the sale of Government tools abroad, maintaining that it was ruining the business of American builders, have withdrawn their objections. Secretary Baker says that the sale abroad was on the basis of August 1, 1914, prices, plus 55 per cent. c.i.f. Antwerp. He adds that the average price advance reported by 133 manufacturers in this line from 1914 to 1918 was approximately 93 per cent., and the average drop on new machinery since the signing of the armistice has been about 20 per cent.

Sales of used machinery by the War Department to date have totalled \$3,200,411.10. This equipment cost the Government \$3,598,833.85; therefore the Government has realized about 82 per cent. of the cost prices.

The first important inquiry from Europe for machine tools since the signing of the treaty of peace, has been issued by the Framerman Industrial Development Co., New York, representative here for the Creusot Works, France. About 30 large tools are required for a steam turbine plant, and immediate delivery is asked.

The Niles, Bement, Pond Co., New York, has received an order from the

Navy Department for 42 large lathes for the naval ordnance plant at Washington, D.C., the cost being about \$750,000.

Four ship repair plants are soon to be built on the Atlantic coast, under arrangement with the Emergency Fleet Corporation. The latter organization will build two 10,000 floating dry docks for each plant, and adequate shops for the repair of ships will be built and equipped. Contracts for this work are about to be signed. The four plants will be operated by the Norfolk and Hampton Roads Ship Repair and Dry Dock Corporation, Norfolk, Va.; the Perth Amboy Dock Co., Perth Amboy, N.J.; the Ramberg Iron Works, Brooklyn, N.Y., and Fraser, Brace & Co., New York City.

Machine tool business in the East continues in moderate volume. The Spicer Mfg. Corporation, Plainfield, N. J., bought about 15 or 20 tools last week, this being the most important buying by any manufacturer in the East in several weeks. Companies making candy machinery are very busy, and several of them are buying new equipment.

Prices are quite firm, and some advances have been made. The tendency toward making concessions is lessening. Machine tool builders are looking for a much better business during the latter half of the year. Many projects are pending which will doubtless come to fruition as soon as the business situation shows a further improvement.

PROVISION IS ALREADY BEING MADE FOR BUSINESS DURING NEXT YEAR

BUYING for next year's requirements of pig iron has started. Transactions of over 20,000 tons have been booked. Following are reports from United States centres:

PITTSBURGH.—The feature of the market has been the buying of large quantities of malleable for the end of this year and part of next. The feeling of consumers is evidently that prices are as likely to go up as down, and this is borne out by the fact that furnaces are not keen on booking business for 1920. There have been fair sales of foundry and bessemer.

BOSTON.—Business during the week preceding the holiday was confined to small lots, mostly of carload proportions. Some sales of 200 to 500 tons were made. Prices have remained firm, and furnaces are not keen on quoting for future business.

BUFFALO.—While the big rush is over a number of enquiries are coming in, and a fair amount of sales are being made. Furnaces are pretty well booked up and not much tonnage is available from stock. More stacks will be put in operation shortly.

NEW YORK.—Demand for pig iron has been very weak, both for domestic use and export. It is understood that the 20,000 tons enquired for from England has gone to a Luxembourg furnace, at \$38.40 c.i.f. an English port, which is away below any American offer.

CLEVELAND.—Sales amounting to about 50,000 tons, mostly for outside points, have been closed during the week. Buying is quieter, as most of the furnaces are booked up for the rest of the year. Steel making grades are still inactive.

CINCINNATI.—Southern furnaces are fairly well stocked up with orders, and prices firmer in consequence. Furnaces are quoting the full schedule price of \$28 for 2.25 to 2.75 silicon iron. No quotations are being made for 1920 iron.

ST. LOUIS.—While quietness is the leading note in the market this week, prospects are good for future good business. Automobile and truckmakers are working to capacity, and stove makers look forward to heavier business than at any time since before the war.

BIRMINGHAM.—Good enquiry for fourth quarter is forthcoming, and if

the demand keeps up it is likely that more stacks will be blown in. Not much iron has been sold for last quarter delivery. Production for July is likely to be much higher than June.

PHILADELPHIA.—The market here is keeping fairly brisk, domestic foundry sales amounting to 20,000 tons being made. Some sales have been made to England at \$39.60 c.i.f. Bristol Channel. There is business enough in sight for two or three months' activity of furnaces now working.

CHICAGO.—Buying of foundry and malleable is progressing normally, but there is no demand for steel making grades as yet. One Chicago interest sold 125,000 tons of pig iron last month, and now reports business picking up again.

STEEL MAKERS ARE IN THE MARKET NOW

Scrap is Being More Eagerly Sought; Some Districts, Though, Remain Dull

The scrap market, although showing dullness in some districts, is, on the whole, firm and on the upward grade. Following are the reports from various centres:

CHICAGO.—With the exception of rolling mill grades, all scrap is active and prices rising. \$25 is predicted for heavy melting steel in the near future.

BOSTON.—There is considerable activity locally, with some price advances. Machine shop turnings are quoted from \$8 to \$8.50, while blast furnace turnings are from \$7.50 to \$8. Rerolling rails have been quoted up to \$16.

NEW YORK.—Dullness due to the holidays in part, has resulted in prices remaining stationary, and, in some cases, dropping slightly. Heavy melting steel is a case in point, this grade dropping about 25c per ton.

PHILADELPHIA.—There is a good demand for all grades, and prices continue to advance. Heavy melting and No. 1 railroad wrought have sold up to \$19 and \$25 respectively. Heavy axle and forge turnings have been sold as high as \$15.

PITTSBURGH.—The steel makers are coming into the market, and dealers are, in some cases, marking up their prices. \$19 delivered for heavy melting steel has been paid, and the quotations are now up to \$20. There is a good demand for rails.

BUFFALO.—There is a brisk market for all grades of scrap, and dealers' stocks are comparatively low. Dealers are predicting a shortage in the near future, especially as no country scrap is offering.

CLEVELAND.—Dealers are offering more for steel than consumers and yard interests are expecting much higher prices for the steel they have in stock. They say they would not consider \$21 for it.

CINCINNATI.—Although little business was done, prices are nominally higher. Demand is better for No. 1 railroad wrought, cast scrap and rerolling rails. Steel turnings show weakening.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	\$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	29 35
Bessemer, Pittsburgh	25 75
Basic, Valley furnace	25 75
Toronto price:—	
Silicon .225% to 2.75%	\$32.75 to \$35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	\$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bar, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, 1/4 in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	2 65
Tank plates, Pittsburgh	2 45
Structural shapes, Pittsburgh	3 05
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs.	C.L.	L.C.L.
Pittsburgh to Following Points			
Montreal	33	45	
St. John, N.B.	41 1/2	55	
Halifax	49	64 1/2	
Toronto	27	39	
Guelph	27	39	
London	27	39	
Windsor	27	39	
Winnipeg	89 1/2	135	

METALS

	Gross	Net
Lake copper	\$24 00	\$22 50
Electro copper	23 00	22 00
Castings, copper	23 00	22 50
Tin	55 00	55 00
Spelter	9 50	8 50
Lead	7 00	6 50
Antimony	9 50	9 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, 1/2 up	\$ 4 50	\$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Butt weld

	Per 100 feet	Montreal	Toronto
1/4 in.	\$ 6 00	\$ 8 00	
1/2 in.	4 68	6 81	
3/4 in.	4 68	6 81	
1 in.	6 21	7 78	
1 1/4 in.	7 82	9 95	
1 1/2 in.	11 56	14 71	
2 in.	15 64	19 90	
2 1/2 in.	18 70	23 76	
3 in.	25 16	32 01	
3 1/2 in.	40 37	51 19	
4 in.	52 79	66 94	
4 1/2 in.	67 16	84 18	

4 in.	79 57	99 74
Standard Lap weld		
2 in.	38 81	35 34
2 1/2 in.	42 12	52 36
3 in.	55 08	68 47
3 1/2 in.	69 00	86 94
4 in.	81 75	103 00
4 1/2 in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8 in.	1 93	2 44
8 1/2 in.	2 22	2 81
9 in.	2 66	3 36
10 in.	2 46	3 12
10 1/2 in.	3 17	4 02

Terms 2% 30 days, approved credit.
Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.	
4 1/2" and larger 50%.	
4" and under, running thread, 30%.	
Standard couplings, 4" and under, 40%.	
4 1/2" and larger, 20%.	

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds.	Montreal	Toronto
Copper, light	\$13 50	\$12 00	
Copper, crucible	17 25	15 00	
Copper, heavy	17 50	15 00	
Copper wire	17 50	14 50	
No. 1 machine composition	13 50	14 00	
New brass cuttings	10 00	9 00	
Red brass cuttings	11 75	9 00	
Yellow brass turnings	8 50	6 50	
Light brass	7 00	5 00	
Medium brass	8 00	6 00	
Scrap zinc	5 50	5 00	
Heavy lead	5 00	4 00	
Tea lead	4 00	3 00	
Aluminum	16 00	12 00	
Heavy melting steel	12 00	9 00	
Shell turnings	7 00	6 00	
Boiler plate	12 00	8 00	
Axles (wrought iron)	17 00	15 00	
Rails	12 00	11 00	
Malleable scrap	15 00	12 00	
No. 1 machine cast iron	20 00	15 00	
Pipe wrought	9 00	5 00	
Car wheels	20 00	18 00	
Steel axles	20 00	20 00	
Mach. shop turnings	5 50	5 00	
Stove plate	15 00	10 00	
Cast boring	5 50	8 00	

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 1/2" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, 1/2" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27 1/2
Machine screws, o. and fl. hd., steel	10

Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fl. hd., brass	net
Nuts, square blank	\$0 75
Nuts, square, tapped	1 00
Nuts, hex., blank	1 00
Nuts, hex., tapped	1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base 3/4" and larger	\$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77 1/2
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55 1/2
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47 1/2

MILLED PRODUCTS

(Prices on unbroken packages)

Set screws	50
Sq. and Hex. Head Cap Screws ..	45
Rd. and Fil. Head Cap Screws ..	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1 1/2 in.	40
Fin. and Semi-fin. nuts over 1 1/2 in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts	net
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1 1/2 in.	add \$1 00
Cold pressed nuts over 1 1/2 in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	\$38 50
Open-hearth billets	38 50
O. H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	\$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, 3/4 in. and larger	\$7 50
Spikes, 1/4 and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 81
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, 1/4-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net
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MISCELLANEOUS

Solder, strictly	\$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, all sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 20 to 50	
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto	

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15½c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	\$ 6 55	\$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright	8 50	8 00
Apollo brand, 10% oz. galvanized		
Queen's Head, 28 B.W.G.		
Fleur-de-Lis, 28 B.W.G.		
Gorbal's Best, No. 28		
Colborne Crown, No. 28		
Premier, No. 28 U.S.		7 50
Premier, 10% oz.		7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

R

¼ in., \$13.50; 5-16, \$11.50; ¾ in., \$9.70; 1 in., \$9.50; Extra for B.B. Chain, \$1.20; Extra for B.B.B. Chain, \$1.80.

\$10.50; 7-16 in., \$9.30; ¾ in., \$10.15; \$13.00; ¾ in., \$9.60; ¾ in., \$9.70; ¾ in., \$9.95; 1 in., \$9.50; Extra for B.B. Chain, \$1.20; Extra for B.B.B. Chain, \$1.80.

ELECTRIC WELD COIL CHAIN B.B.

¾ in., \$16.75; 3-16 in., \$15.40; ¾ in., \$14.20; 5-16 in., \$11.50; ¾ in., \$10.50; 7-16 in., \$9.30; ¾ in., \$10.50; ¾ in., \$10.00; ¾ in., \$9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	\$25 00	\$ 20 00
1¼ in.	27 00	22 00
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	45 00	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto less 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	06
Lard oil, per gal.	\$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls, net	10½

BELTING—No 1 OAK TANNED

Extra heavy, single and double.	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	\$2 00
Luffkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass sheets, 24 gauge and heavier, base	\$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	.09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard	10%	Best grades	15%
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ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	\$42 50	\$43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	\$10 25	\$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50
Cut sheets, ½c per lb. extra.		
Cut sheets to size, 1c per lb. extra.		

PLATING CHEMICALS.

Acid, boracic	\$.25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

*A Complete Line 8 in. to 50 in. Swing.
with or without tapping attachment.*

BARNES

Upright Drills Horizontal Drills Gang Drills

**Accuracy—Strength
Convenience of Operation**

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MONTREAL

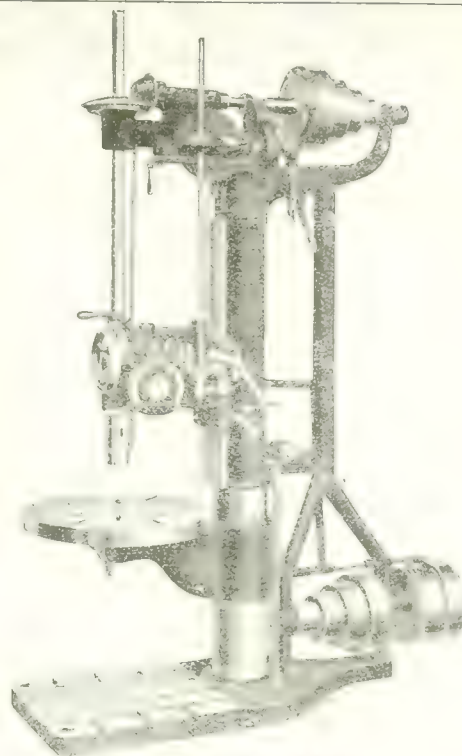
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WINNIPEG

VANCOUVER

HALIFAX

BUFFALO, N.Y.



26 in. Slid. Head Type

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

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Steel Foundry Division, Lachine Canal

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Phone Victoria 1492

MORROW INGERSOLL

Best jobbers carry "Morrow's."

"Morrow" Screws (it's the finishing die that does it).

"Morrow" Nuts.

"Morrow" Twist Drills "will do more drilling with less regrinding."

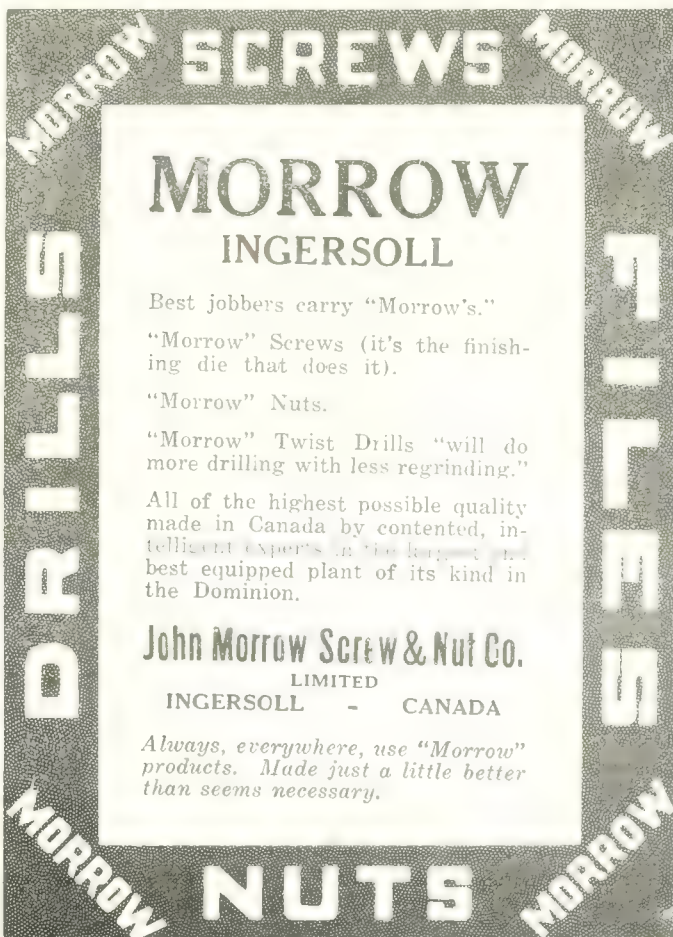
All of the highest possible quality made in Canada by contented, intelligent experts in the largest and best equipped plant of its kind in the Dominion.

John Morrow Screw & Nut Co.

LIMITED

INGERSOLL - CANADA

Always, everywhere, use "Morrow" products. Made just a little better than seems necessary.



DISAPPEARANCE OF THE OLD TIME SHOP JOKER (Continued from page 57.)

And now comes the sequel. This chap had a wife and four children on the way over, and had tried very hard to secure some employment previous to coming to our firm, but without success.

He had landed this job at our plant, and if left alone, might have, in fact, no doubt, would have filled the bill, for the class of work he would have been given would have been fairly simple. However, our humor (?) changed all this, with the result that when his wife arrived they had some plugging before they could make ends meet. He could not secure a position and she was forced to work until later, when, on hearing the circumstances, we went to the foreman and requested he look over the matter and bring him back. The foreman was a good sort, saw our point of view and brought the fellow back. We had learned our lesson in the meantime with the result that

later this chap spoken of developed into a first-class drill hand.

Of course we all remember the old trick of smearing the bottom of the file handle with red lead, of sending the greenhorn for the rubber wrench with glass jaws for polished work, and last but not least, the old, time-worn, hairy, and gory quest after the left-handed monkey wrench.

These are harmless, foolish jokes, but nevertheless interfere with efficiency in the shop. Compare the shop of 10 years ago with the plant of to-day and note the decided improvement over former conditions.

Operations, etc., are now systematized to such an extent that there is no time for such humor, for which we offer due thanks. Practical joking may be all right in its place, but its place is not in the shop, or office, especially in business hours.

THE PERFORMANCE OF THE MOTORS THAT CROSSED THE ATLANTIC FIRST

The crowning triumph for the Rolls-Royce aero engine is the first direct Atlantic flight, accomplished in 15 hours, 57 minutes, on a Vickers "Vimy" plane. Not the least remarkable part of the feat is the high average speed maintained, viz., 117½ miles an hour. Evidently the two Rolls-Royce engines fitted to the Vickers Vimy plane must have worked perfectly throughout the 1,880 miles flight.

It has been calculated that if the Atlantic crossing were completed in 20 hours by one Rolls-Royce engine running at an average of 1,800 revolutions per minute, its performance would be as follows (in a two-engined plane such as the Vickers Vimy the operations would naturally be doubled): Each engine will make 2,160,000 revolutions, and each piston will travel up and down the interior of its cylinder a total distance of 440 miles. As the Rolls-Royce engine has 12 pistons they will in all travel 5,280 miles. The valves will be operated some 25,920,000 times in each engine, the magnetos and sparking plugs having to deliver the same number of sparks for the ignition of each engine.

The recent history of the Rolls-Royce aero engines discloses one or two very interesting facts.

On Nov. 11, 1918, when the armistice was declared, there were in possession of the R.A.F., Rolls-Royce aero engines of a total horse power of over 1,000,000, which far exceeded that of any other make of aero engine in use. Previous to armistice day, Nov. 11, 1918, there had been constructed 122 Handley-Page bombers of which no less than 113 were fitted with Rolls-Royce engines. Prior to the same date, 1,524 complete Bristol Fighters had been delivered, of which number 1,364 were also equipped with Rolls-Royce engines. Rolls-Royce engines were used exclusively in the planes of the London-Paris Government courier service for the conveyance of the ministers, officials and despatches to and from the Peace Conference, the speed record between London and Paris, viz., 75 minutes, standing to the credit of the Rolls-Royce aero

engine. The only two aeroplanes which have flown from England to India were both fitted with Rolls-Royce engines.

MONTREAL NEWS

L. A. Desy, consulting engineer of Montreal, will shortly complete the construction of a large power plow, capable of plowing a strip of land 40 feet in width; the plow is of unique design and will be ready for a practical demonstration in the course of a few weeks.

Canadian Vickers employees return to work this week after a strike of six weeks' duration. Negotiations have been carried on constantly and no disturbances marked the progress of the strike.

In order to take care of the increased railway requirements on the harbor front, the Montreal Harbor Commissioners may take over the south side of Common and Commissioners streets—which is their property—and lay down railway tracks. In view of this the Harbor Commissioners have requested the city to transfer the tram tracks to the south side of the street.

Residents in the vicinity of the Montreal abattoirs are, at last, assured that their nasal organs will be relieved of the offensive odors arising from the production of animal food. Plans now in progress will, it is claimed, guarantee smell-proof rendering plants.

Roy M. Wolvin, vice-president and managing director of the Halifax Shipyards, has been elected a director of the Dominion Steel Corporation. Mr. Wolvin's knowledge of the transportation of ore and coal will prove of inestimable value to the steel corporation.

That inter-Empire trade opportunities await Canadian manufacturers is shown in the visit of G. E. Whitehouse, of London and Edinburgh, who is here on the invitation of the Canadian Government, to ascertain the commercial possibilities of this country. "You can produce more manufactured articles than you can consume, because your

population is small," said Mr. Whitehouse, "and you may just as well sell those things to us and keep the business in the family, for the more business there is between two people the better they will understand one another. What I want to find out is the names of the firms who are actually ready and willing to ship their products to England."

The possibilities of export business is exemplified in the loading this week of twenty Canadian built locomotives, on the Elder Dempster freighter Kwarra, for the South African Government Railways. The same boat will carry a large number of Canadian-made automobiles.

Numerous icebergs are reported along the coasts of Newfoundland and are proving a menace to Atlantic shipping. Last week the C.P.R. liner Gramscian was seriously damaged, and several weeks in drydock will be required for repairs.

With the announcement that the steel plate mill at Sydney will be completed and the old contract fulfilled, we are almost assured of an extended period of shipbuilding activity. It would not be surprising to hear of additional ship contracts being let by the Government.

The Thos. Davidson Manufacturing Company of Montreal are building a large addition to their present plant on Delisle street, to take care of their rapidly increasing business. The grey iron foundry work has been discontinued at the main plant and a new modern foundry building, 100 x 74, is being constructed at Turcot, adjoining the steel plant of the company.

The Jas. Buckley Co. of Montreal have obtained the exclusive Canadian agency for the Mahrvel line of oil furnaces and blow torches, manufactured by the Mahr Manufacturing Company of Minneapolis, Minn.

The French gunboat La Somme, after some strenuous patrol duty off the banks of Newfoundland, is paying a visit to Montreal, and will participate in the celebration that is being held this week, to commemorate the fall of the Bastille. The vessel is one of 800 tons displacement, fitted with twin Parsons geared turbines and capable of 20 knots.



Aikenhead's Wahlstrom Attachment

**The Tool that
drives down
tapping costs.**

The "Wahlstrom" attachment taps holes as squarely as they can be drilled ten times faster than is possible by hand—and reduces tap breakage to a minimum.

Mechanically obtained oscillating movement closely imitates hand tapping.

The Wahlstrom is built for long service. There's nothing to get out of order. Fits any drill press. Makes taps of all sizes up to ½-inch. May we send one on trial? We'll promptly refund your money without question, if you are not satisfied.



Aikenhead's Starrett Tools

The Best That Money Can Buy

Starrett Micrometer Calipers have a more exact and easier way of adjustment than by the old method of a movable anvil. Over the barrel is a thin, graduated sleeve, and on this sleeve is the zero line, instead of on the barrel itself. The thin sleeve keeps dirt from the screw and after years of use a turn of this sleeve brings the zero line correct to

A knurled locking nut contracting a split bushing around the spindle tightens and keeps the spindle central and true, or by a slight turn locks it firm, making a solid gauge when desired. Anvil and spindle are hardened, ground and lapped.

Compensate for Wear

Send for bulletins.

AIKENHEAD HARDWARE, LIMITED
17 Temperance St., Toronto

She was fully armed during the war, but is now reduced to one gun forward.

On and after July 1st, the firm that has been known as H. Boker and Co., Inc., Canada, will be conducted under the name of the Pilot Steel and Tool Company, Limited. The new company will be operated as a distinctly Canadian corporation but will continue to be affiliated with H. Boker Co., of New York, representing the latter in Canada. The Pilot Steel and Tool Co., as the Canadian representatives of the New York firm, will act as sole agents in Canada for the entire output of Jonas and Colver, Ltd., of Sheffield, England, makers of Novo Superior high speed steel, Novo high speed steel, Intra steel, hot and cold rolled tool steel, circular saws, planer knives, files, etc. All the other lines formerly handled by the old company will continue to be stocked by the new company. The directorate of the new company will be practically identical with that of the old concern. F. E. Rejall who has been Canadian manager for a great number of years, will henceforth act as vice-president and director, and continue the management as heretofore.

As an instance of the ability of ships built on the Isherwood system to resist severe strains, the case of the oil tanker "San Zeferino," is typical. This vessel sunk after being holed in the engine room, which was right aft. Her stern sank in 90 feet of water, till her stern-post rested on the bottom, but the buoyancy of her oil cargo, kept the fore part up so that her fore foot was out of water. She remained in this position for a

month before being floated, when a good portion of her oil cargo was salvaged in perfect condition, and the hull was in an absolutely unstrained condition.

An account of a dry dock for which patents are pending comes from the United States which reads like a fairy story. It is said to be the product of ten years' engineering study. The new

dock will, it is said, have a speed of 42 knots per hour, and will be able to go to sea and relieve vessels in distress as well as perform the usual functions of a dry dock. It will be fitted with cranes and winches which will enable it to grapple with and raise any vessel existing. No details are given as yet, but they will be looked for eagerly.

Special Announcement

A FEW weeks ago we asked readers of CANADIAN MACHINERY, especially those engaged in the study of our Drafting Course, to state their views regarding the suspension of this course until Sept. 1.

So far the majority of letters suggested the plan of stopping work until this date, when the weather would be cooler. There are other students who unfortunately did not send in their views, so we must, for the present at least, follow the plan of closing the course until the fall.

Following are the winners for Plates Nos. 4 and 5. Later we will announce the winners for Plates 6 and 7. Should students desire a continuance of the course, without this vacation, so to speak, our only method of knowing their mind is by receiving letters, so be governed accordingly.

ANNOUNCING THE PRIZE WINNERS

PLATE No. 4

Hugh Scott, 27 Helena Ave., Toronto, Ont.
Wm. Williamson, 10 Crombie St., Galt, Ont.
Thos. Dunbar, 115 Proctor St., Sarnia, Ont.

NOTE.—Hugh Scott has now landed his second prize. Former winners, get busy after Sept. 1st, and land some more prizes.

PLATE No. 5

Leonard Snary, 170 E Superior St., Chicago, Ill., U.S.A.
David Winton, 95 Cedar St., Galt, Ont.
Joseph Wenzel, 438 Franklin Ave., Hartford, Conn., U.S.A.

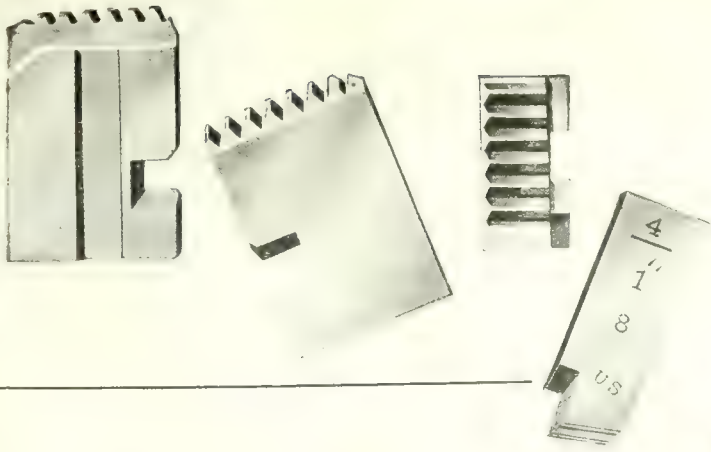
NOTE.—Two prize winners are from the land of Uncle Sam, showing that CANADIAN MACHINERY is well read, and distributed.

Current Events in Photograph



First Dirigible to Cross Atlantic

The photo gives a good idea of the great size of the R-34. It was taken shortly after the explosion which tore the dirigible from her moorings. The explosion was caused by the gas in one of the front sections becoming heated by the sun. It tore a section of the outer skin thirty feet long from the forward lower surface of the gas bag. This accident has delayed the return trip of the huge aircraft. But it is now on its way, having left Wednesday at midnight.



Sharp Chasers Cut Clean Threads

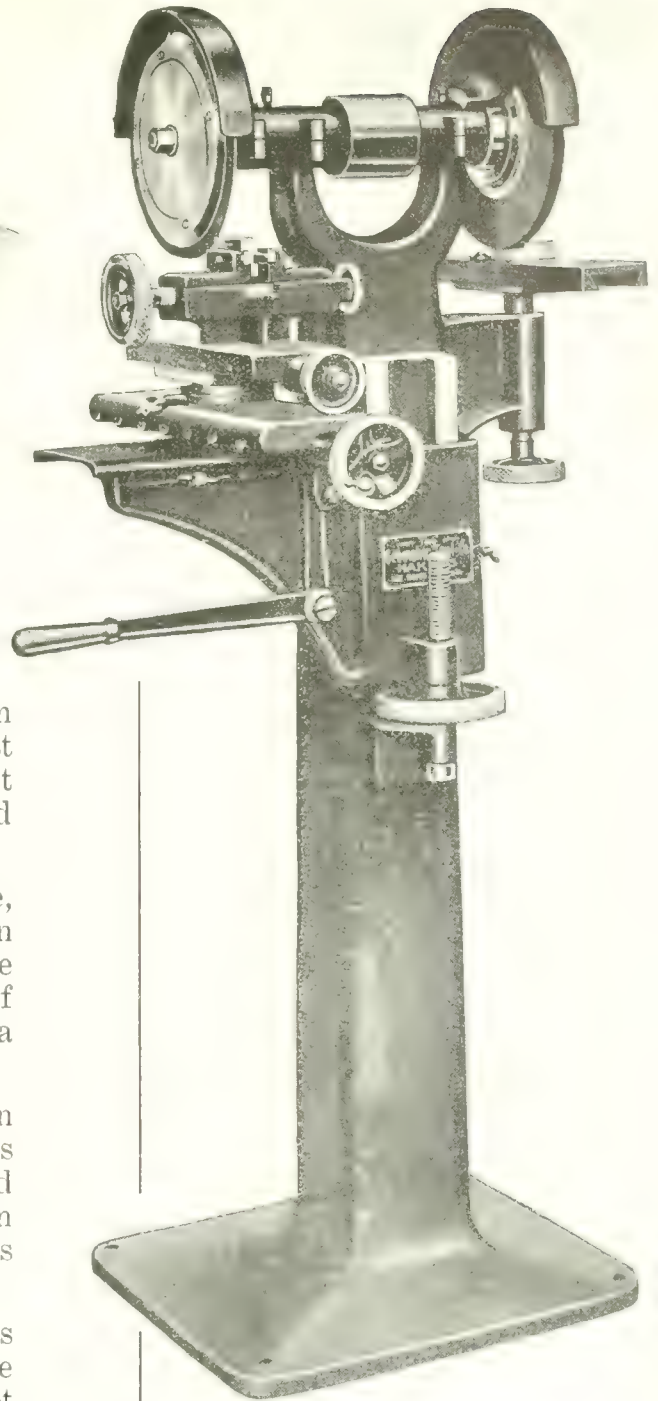
Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalog describing this machine is a mine of information on chaser grinding. Write for it.

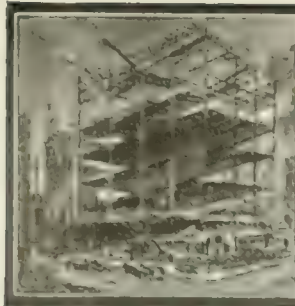


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NEW HAVEN CONNECTICUT

Canadian Agents:

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS [PERSONAL AND TRADE NOTES]



MUNICIPAL

The Kemp-Smith Manufacturing Co., Milwaukee, Wis., has issued a new general catalogue, descriptive of Kemp-Smith milling machines. This catalogue is composed of four-page circulars, each complete in itself.

Toronto.—The Dominion Shipbuilding Co. launched their seventh ship in the past nine months last week. This was the steamer "Hessa," a full sized freighter of 3,650 tons deadweight. Her dimensions are 261 feet by 43 feet 6 inches, by 24 feet 2 inches; her engines of the triple expansion vertical type, being designed to develop 1,200 h.p. She is fitted with two Scotch marine boilers, working at 180 lbs. per sq. in. steam pressure. The Dominion Shipbuilding Co. have orders for five more steamers to be delivered this Fall and next Spring.

St. Catharines.—The St. Catharines Journal says, in a recent issue: "When Mr. Gaby, chief engineer of the Hydro-Electric Commission, was before the City Council a week or so ago, he stated in reply to quotations furnished by Mayor Elson and Alderman Riffer, that the Commission could buy steel rails to-day at \$40 to \$45 per ton. The above two members of the council, who had prices on such materials, said their information was that rails cost from \$55 to \$65 to-day. A copy of the Daily Iron and Metal Trade newspaper, just to hand gives a report of the bid of an United States firm on a shipment of 5,000 tons No. 1 steel rails for Glasgow as \$87 a ton. It adds that this was \$8 per ton below the lowest British bid. In view of such prices prevailing in the United States the price quoted by the chief engineer of the Hydro is all the more mystifying."

TRADE GOSSIP

Major A. G. G. Hutter has taken up the management of the Montreal office of the firm of Wonham Bates & Goode, Inc., New York and London, exporters and importers. Previous to going overseas Major Nutter was connected with Mussen, Ltd.

Plant Closes.—The plant of the Brunner Mond Company at Amherstburg has been closed down, to stay so until labor conditions become such that business can be carried on. The plant, which is a subsidiary of the Solvay Process Co. of Detroit and Syracuse, is the largest in this country. Several hundred men are affected by the unexpected development.

Ready for Operation.—Canadian En-

gines, Ltd., manufacturers of stationary and portable gas and gasoline engines, grain grinders and saw frames, who were practically closed down during the war, have resumed operations, and are taking on a full complement of men. They report an abundance of business in view and that the prospects are favorable for a busy time throughout the year.

Tanning Company Extends.—Advices from Kitchener, Ont., state that the Lang Tanning Company, one of the pioneer industries of the city, will make a considerable addition to its plant. This will consist of two buildings each 100 by 200 feet, four-storey brick construction. The present staff, which numbers about 200, will be increased to 300 and possibly more when the new buildings are ready.

Britain's Lumber Requirements.—The enormous quantities of timber required for the British Government's new housing program, is being mostly supplied from Baltic sources. The rates on Canadian lumber, always higher than those from Scandinavia, are now in the proportion of three to one. The whole question is one of shipping facilities, and if Canada could solve these difficulties, she would have a chance of competing with the Scandinavian countries.

New Power Plant.—A huge power plant is being constructed on the Winnipeg River at DuBonnet Falls, 75 miles north of Winnipeg. The Winnipeg River Power Company, backed by Mackenzie & Mann interests, are the owners. The ultimate capacity of the plant will be 168,000 horse-power, in six units of 28,000 each. The development will take three years, and will cost \$700,000.

Ship Plate Agreement.—An important decision was made for the Dominion Steel Corporation when the Government decided to renew the plate contract at a reduced price. This is not only helpful to the company itself, but will naturally help the immediate district, and, indirectly, the whole country. The amount of money involved is in the neighborhood of \$4,000,000. It may also mean the continued building of ocean-going ships in Canada, as the fact of being able to obtain plate in Canada should materially bring down the building cost.

Industrial Convention.—The forthcoming Industrial Convention in Alberta shows promise of being a great success. More than 150 American Chambers of Commerce have written signifying their

intention of assisting in the good work, any many of them are sending delegates. The congress will be held in Alberta from Aug. 11 to 16, with special sessions in Calgary Aug. 13 and 14. Congress headquarters are at Palliser Hotel, Calgary.

To Attend Athens Fair.—The fair at Athens, which commences on October 13th, will contain exhibits of Canadian manufactured goods. This is the result of Mr. Lloyd Harris's efforts to interest Canadian manufacturers in the possibilities of the Balkan markets. One of the methods of placing the goods before the visitors to the exhibition is by photo, and a large number of these have been sent. The invitation to attend came through the Federation of British Industries. The Canadian Manufacturers' Association has a representative who is interviewing all manufacturers whose goods might be suitable for the Balkan trade.

Trade Commissioner's Views.—The Canadian Trade Commissioner from Manchester, England, has been visiting Toronto, and has some interesting things to say about the prospect of trade with Great Britain. He states there will be a good market for Canadian manufactured goods and raw materials in the Old Country for the next three or four years, and gave instances of orders recently placed by English firms in Canada. He mentioned a half million dollar order for confectionery placed by a Manchester firm in Canada, besides huge orders for rivets, wire nails and wire. There is a shortage of three-quarter million homes in Great Britain, and enormous quantities of windows and doors would be required.

New Steel Appointments.—Two important appointments are announced by the Dominion Steel Corporation. Mr. Roy M. Wolvin has been elected a director to fill the existing vacancy on the board, and his expert knowledge of shipping should make him a valuable adviser. Mr. Wolvin has been identified with lake shipping for a considerable period. He was president and general manager of the Montreal Transportation Co., and later vice-president of the Halifax Shipyards, Ltd. Mr. H. J. McCann has been appointed assistant to Mr. Mark Workman at the Montreal offices. Mr. McCann has advanced to his present position through various departments of the steel company, with which he has been identified for some years, entering its services as a telegraph operator.

Vancouver Terminals.—In connection with the construction of the new barbor terminal facilities at Vancouver, Mr. McCay, Harbor Commissioner, states that an effort will be made to have the terminals built entirely by veteran labor. He says that with returned soldiers the work can be done better, quicker and cheaper than by the employment of contract labor. In support of this contention he instanced the construction of Industrial Island under the Crafton Street Bridge, on which the Harbor Commissioners saved 10% of the cost. From the ranks of the Canadian Engineers, who had overcome such grave difficulties in France, Belgium and Palestine, men could be found to fill all the technical positions, as well as the rank and file.

Serious Coal Shortage.—A number of circumstances are combining to make the coal situation a serious one. Labor troubles and transportation difficulties are the chief of these. The production of bituminous coal for the six months of this year was approximately 212,000,000 tons, which is 700,000,000 tons less than for the corresponding period last year. As the estimated requirements for the year are 560,000,000 tons, much greater production will be required for the ensuing six months to make up the average. This is unlikely to be achieved, as the labor force at the mines is about 10% below last year's. Add to this suspension of labor due to wage negotiations which are pending, and the prospects of a serious shortage cannot be denied.

Norton Changes.—The business of the Norton Grinding Co. of Worcester, Mass., has been merged into that of the Northern Co. The name of the Grinding Co., associated with the Precision metal grinding machine, will disappear entirely. Besides the large foreign selling force, arrangements have been made to open branches in Norway and Sweden. A new store has also been established in Detroit. Officers of the new company are: George I. Alden, chairman of the board; Charles L. Allan, president and general manager; Aldrans C. Higgins, treasurer and general counsel; George N. Jeppson, secretary and works manager; W. LaCoste Neilson, vice-president and factory manager; and Carl F. Dietz, vice-president and general sales manager. Formal announcement was made of the establishment of a factory in Japan and foreign sales agencies in several foreign countries which Mr. Neilson has frequently visited during the last few years and with whose conditions he is personally familiar.

MARINE

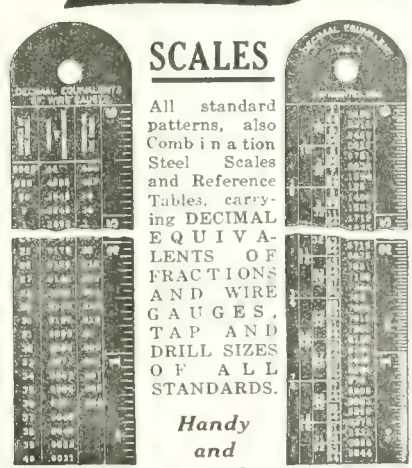
Ottawa.—Besides the six ships of the new Canadian Government marine already launched, it is expected that thirty more will be completed this year. The remaining vessels will be completed before the end of 1920.

London.—Sir Auckland Geddes, Minister of National Service and Reconstruction, in reply to a question in the House

of Commons, stated that the Government had made a profit of approximately £10,000,000 from premiums on shipping war risks insurance.

Port Arthur.—The contract for the new break-water to be built this year has been awarded to Chambers, McQuigge and McCaffrey Company of this city. Arrangements are being made to commence the work immediately. The Thunder Bay contracting company has secured the contract for the revetment wall at Fort William, and have already started operations.

Ottawa.—A start will be made this year on the construction of a new dry dock at Esquimalt, the total cost of which will be \$400,000. The amount to be expended this year will be in the neighborhood of \$500,000. Other harbor works for which money has been voted include Champlain Dry Dock, Quebec; River St.



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FOR SHIPBUILDERS ETC. ETC

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SHIPBUILDERS

Charles, Quebec; St John harbor improvements, Toronto harbor improvements, Vancouver harbor improvements, Victoria Harbor improvements, breakwater at Collingwood, and several smaller undertakings.

London.—Robert Houston, M.P. for Liverpool, and himself a large ship-owner, called attention in the House of Commons to the threatened competition of the U.S. in the shipping trade, and asked in view of the sacrifices made by British ship-owners during the war, whether the Government would make diplomatic representations to the U. S. with the object of preventing competition and friction between the two countries.

MARINE

The City of Belleville requires tenders for the construction of Sanitary Sewers. Tenders to be delivered up to July 18th. Plans and specifications can be seen at the office of the City Engineer.

The Department of Public Works are offering for sale a 70-ton "Bucyrus" steam shovel and ten dump cars, situated at Booth Street Yard, Ottawa. The material can be seen at this address between 7 a.m. and 5 p.m. on application to the Superintendent of Dominion Buildings, Ottawa. Tenders will be received up to July 21st.

Tenders addressed to H. F. McNaughten, Secretary of Public Works, Ontario, will be received up to July 21st for an extension to Macdonald Hall and for a piggery, in connection with the Agricultural College, Guelph, Ont. Plans and specifications can be seen at the Bursar's office, Agricultural College, Guelph, and at the Department of Public Works, Toronto.

INCORPORATIONS

The Canadian Aero Co., Ltd., has been incorporated with head office at Brantford and a capital stock of \$50,000, divided into 500 shares of \$100 each, to establish a general aircraft service, carrying passengers, mail and freight.

A company has been incorporated with a capital stock of \$24,000, divided into 240 shares of \$100 each, and known as the Canadian Type Registering Scale Co., Ltd., with head offices at Hamilton, to manufacture scales and type registering devices.

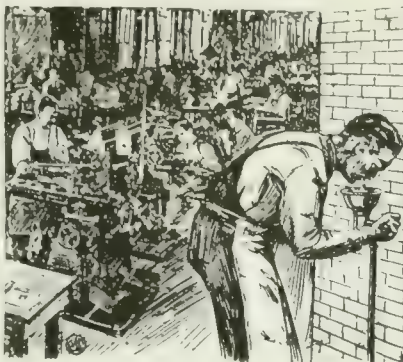
The Premier Paper Products, Ltd., has been incorporated with head offices at Sarnia, Ont. The capital stock will be \$650,000 in 500 shares of \$100 each. The object of the company is to manufacture and deal in paper cardboard and other products of paper or pulp, and engage in a general lumber business.

The Canada Petroleum and Refining Co. has been incorporated with head offices in Toronto. The capital stock of the company is to be \$2,500,000, divided into 2,500,000 shares of \$1 each, and the object of the company is to carry on a general business in crude petroleum and its products.

PERSONAL

The Seneca Falls Manufacturing Co., Inc., Seneca Falls, N.Y., have issued a booklet on the quality and precision lathes manufactured by themselves. This publication lists the various sizes and kinds of "Star" and screw-cutting engine lathes.

Upon the Health of your employees depends your profit and production



Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO **SANITARY DRINKING FOUNTAIN**

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.



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Power Press Bargains



Partial Selection from our Big Stock:

- 3—Used FERRACUTE D-201 Vertical Double-gearied Straight-sided Single-action Redrawing Presses, having capacity for exerting pressure of 200 tons. Length of stroke, 10". Distance between columns, 32".
- 1—Used FERRACUTE D-151 Vertical Double-gearied Straight-sided Single-action Redrawing Press, exerting 150 tons pressure. Length of stroke, 13". Width between columns, 32".
- 6—Used FERRACUTE DGG-56 Vertical Double-Gearied Straight-sided Single-action Redrawing Presses; 5 of these presses have 18" length of stroke and 1 has 20" length of stroke. Distance between uprights, 30".
- 7—Used FERRACUTE DGG-56 Vertical Double-Gearied Straight-sided Single-action Redrawing Presses, exerting 100 tons pressure; 6 of these presses have 15" length of stroke and 1 has 12" length of stroke. Distance between housing, 30".
- 6—Used FERRACUTE DGG-55 Vertical Double-gearied Straight-sided Single-action Redrawing Presses, exerting 75 tons pressure. Three of these presses have 15" length of stroke and three have 18" length of stroke. Distance between housing, 26".
- 1—Used FERRACUTE C-5 Open-back Inclinable Cutting Press, Direct Belt Drive., that is, not geared, having capacity for exerting about 50 tons pressure. Length of stroke 2". Distance from centre of ram back to frame, 12". Width of opening through back, 18½". Height of opening through back 7½".
- 3—Used FERRACUTE PAG-4 Geared Adjustable Bed Punching Presses, having capacity for exerting 50 tons pressure. Length of stroke, 2". Distance from centre of ram back to frame, 8½".
- 3—Used FERRACUTE PA-3 Adjustable-bed Punch Presses, not geared, having capacity for exerting about 35 tons pressure. Length of stroke, 2". Distance from centre of ram back to frame, 7".
- 1—Used BROWN-BOGGS No. 215 Inclinable Power Press. This is a geared press. Arranged with 24" x 6" pulley. Distance back from centre of slide, 9½". Distance from bed to slide, when up, 13¾". Width between gibs, 11⅞". Length of stroke, 4".
- 7—Used FERRACUTE D-45 Horizontal Double-end-Screw Press designed for deepening or redrawing sheet metal tubes and shells about 3" diameter and 18" deep. Capacity for exerting 100 tons pressure. Three of these presses have length of stroke of 36" and 4 have length of stroke of 40". Diameter of ram screw, 6½". Diameter of side rods, 5".
- 2—Used E. W. BLISS No. 60½ Vertical Geared Rack-driven Presses. Length of stroke, 36".
- 3—Used FERRACUTE E-57 Vertical Geared Toggle Coining Presses. Length of stroke, 3".
- 5—FERRACUTE E-56, Vertical Geared Toggle Coining Presses. Two of these machines have 3" length of stroke and 3 of them have 2" length of stroke.
- 4—Used No. 666 Vertical Geared Toggle Presses, manufactured by the TOLEDO MACHINE & TOOL COMPANY. Having 2¼" length of stroke and capacity for exerting 1,000 tons pressure on ram.

NOTE:—The above presses were all operating on manufacture of Cartridge Cases when work stopped about nine months ago. They were purchased new from manufacturers from February, 1915, to September, 1915, and have had about two years' service. They were not used continually since being purchased. Some have been repaired and all have been kept in good running order—Examination can be made in Montreal.

TERMS:—25% with order balance against Bill of Lading.

NOTE:—If these presses were to be shipped back to the United States there would be no duty to be paid—You would only require to add freight from Montreal to destination (except Brown-Boggs Press).

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Montreal, P.Q.

Established
1891



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Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.

Ingersoll-Rand 800 ft. Air Compressor. 1 Tube Mill Fraser & Chalmers 5 x 22. 1 Power & Mining 5 x 22.

Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

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Used locomotive crane.
Engine—Double-cylinder, 9" x 12" stroke.

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All motions operated from one platform.

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For sale, one 35-ton shunting locomotive, complete with trailer, tender, air pump, etc.

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BRANTFORD PATTERN WORKS ARE PREPARED to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell Phone 631; Machine Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (c1m)

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Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

Allentown Experimental Works

Allentown, Pa., U.S.A.

DRAIN TENDERS WANTED

Tenders will be received by the undersigned Commissioners up till 2 o'clock p.m. Saturday, the 26th day of July, 1919, for the repair to the 3-4 Sideroad and 8-9 Concession drain, in the Township of Brooke, County of Lambton. Estimate cost of excavation, \$9,600. Contractors must furnish security for the completion of the work. Plans and specifications may be seen at the office of the Clerk, Lot 16, Con. 9, Brooke Township. Lowest or any tender not necessarily accepted.

L. LINDSAY, R.R. No. 2, Alvinston.
C. ATKIN, R.R. No. 1, Inwood.
Commissioners. (c4m)

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (c1m)

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FOR SALE—One used lighting unit, consisting of one 25 K.W., 125 volt, 200 ampere direct current generator to operate at speed of 320 to 350 r.p.m. Generator made by Westinghouse Company. This machine is directly connected with a Goldie & McCulloch 9x10 Ideal engine. This machine can be examined and all particulars obtained at the plant of

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1—30 H.P. Crocker Wheeler, 750 R.P.M., 25 cycle, 550 volt, 3 phase with slide base and starter, no pulley.

1—Canadian General Electric 25 H.P., 550 volt, 25 cycle, 3 phase, 750 R.P.M., Form K Induction Motor with slide base, 16" x 8" pulleys and starting compensator.

1—75 H.P. Fairbanks-Morse Induction Motor, 550 volt, 25 cycle, 3 phase, type B, Speed 750 R.P.M., complete with sliding base and starting compensator.

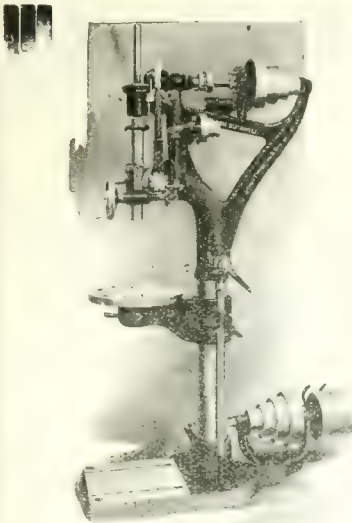
1—35 H.P. Crocker Wheeler, 550 volt, 25 cycle, E Phase, 750 R.P.M., with starter, base and pulley.

5—50 H.P. Westinghouse Type CCL, 550 volt, 25 cycle, 3 phase, 750 R.P.M. with base, pulley and starter.

1—50 H.P. Canadian Fairbanks-Morse Motor, 550 volt, 25 cycle, 3 phase, 750 R.P.M., complete with slide base, pulley and starting compensator.

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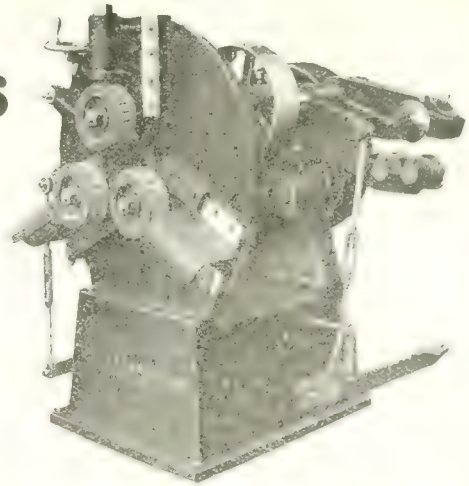


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Mill and Mining Machinery

1 Babcock & Wilcox Water Tube Boiler, 100 h. p., 36 in. x 20 ft. 0 in., 4 in. Tubes with complete fittings. Working pressure 150 lbs.
1 Blaisdale Air Compressor, 14 x 14 and 22 x 16, 150 r. p. m. Duplex Steam, Compound Air. Steam and air pressure 100 lbs. Displacement 1125 cu. ft. per minute
1 C. C. Canadian Rand Compressor, 9 x 12, 14 x 12
1 Matheson Feed Water Heater, 3 ft. x 18 in.
1 Stack, 60 ft. x 30 in. x 3-16 in. Steel.
1 Lidgerwood Single Drum Friction Hoist, 10 x 12-54 in. and extra piston. Corrugated Drums built to carry 1100 ft. 1 in. rope. Load 4,500 lbs. Maximum speed 800 ft. per minute at 100 lbs. pressure. Including Dial Indicator.

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State condition, make and price. We pay cash for any type of machines, motors or belting.

Give full details in first letter.

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1—"Used" Plate Punch and Shear 36" gap, capacity 7/8" hole in 7/8" plate

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1—"Used" Air Compressor, steam actuated—compound steam—simple air 12" x 12" cylinder.

Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

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2 and 3 Phase—25 Cycles.

K.W.	Volts.	R.P.M.	Cylinder Dimensions.
100	220	175	8 x 8"
150	220	214	11 x 12"
200	220	214	14 x 14"
300	220	214	18 x 18"
400	220	214	24 x 24"
500	220	214	30 x 30"
600	220	214	36 x 36"

2 and 3 Phase—60 Cycles.

K.W.	Volts.	R.P.M.	Cylinder Dimensions.
100	440	175	8 x 8"
150	440	214	11 x 12"
200	440	214	14 x 14"
300	440	214	18 x 18"
400	440	214	24 x 24"
500	440	214	30 x 30"
600	440	214	36 x 36"
100	240	175	10 x 20 x 18"
150	240	214	14 x 22 x 16"
200	240	214	18 x 28 x 30"
300	240	214	24 x 36"
400	240	214	30 x 42 x 48"
500	240	214	36 x 48 x 54"
600	240	214	42 x 54 x 60"

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Offices: New York, Pittsburg, St. Louis

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MOTORS.

- 4 200 H.P., 440 Volt, 3 Phase, 25 Cycle.
- 1 150 " 440 " 3 " 25 "
- 2 100 " 440 " 3 " 25 "
- 6 60 " 440 " 3 " 25 "
- 3 150 " 550 " 3 " 25 "

Also a large number of smaller Motors 25 and 60 Cycle, 220, 440, 550 and 2,200 Volts.

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A large number of Transformers, 6,600 to 550 Volts and 6,600 to 440 Volts.

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2—5-ton Storage Battery Locomotives, 36" Gauge, 40 Cells, M.V., 13 iron-clad Oxide Storage Battery, capacity 189 amps. per hr.

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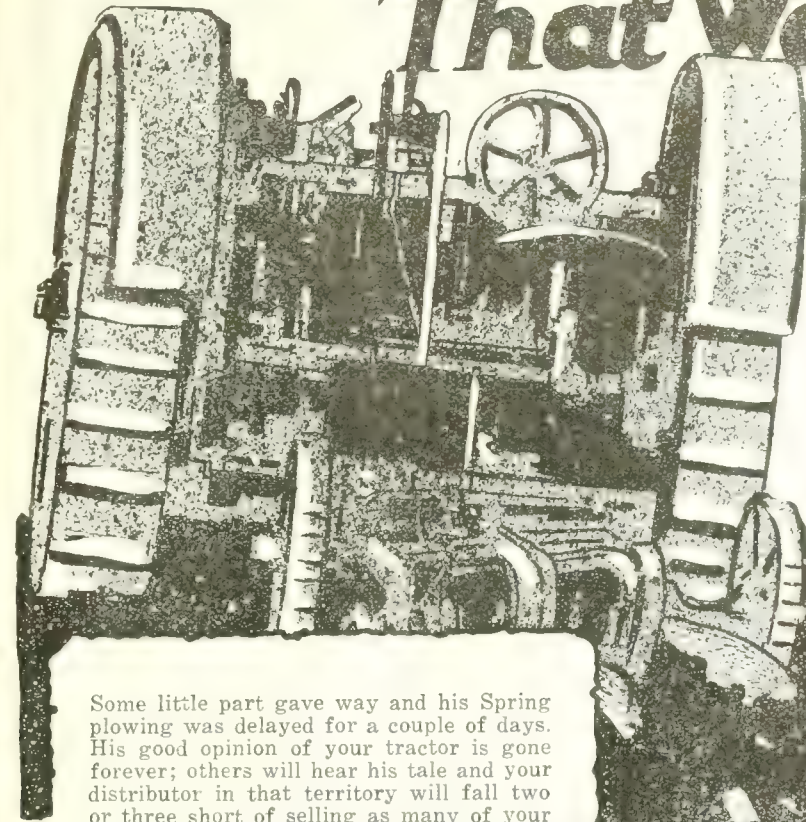
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insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform **always**, the result is a finished product of maximum tensile strength which will stand up under the hardest usage. The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

To-day is a better day than to-morrow—write.

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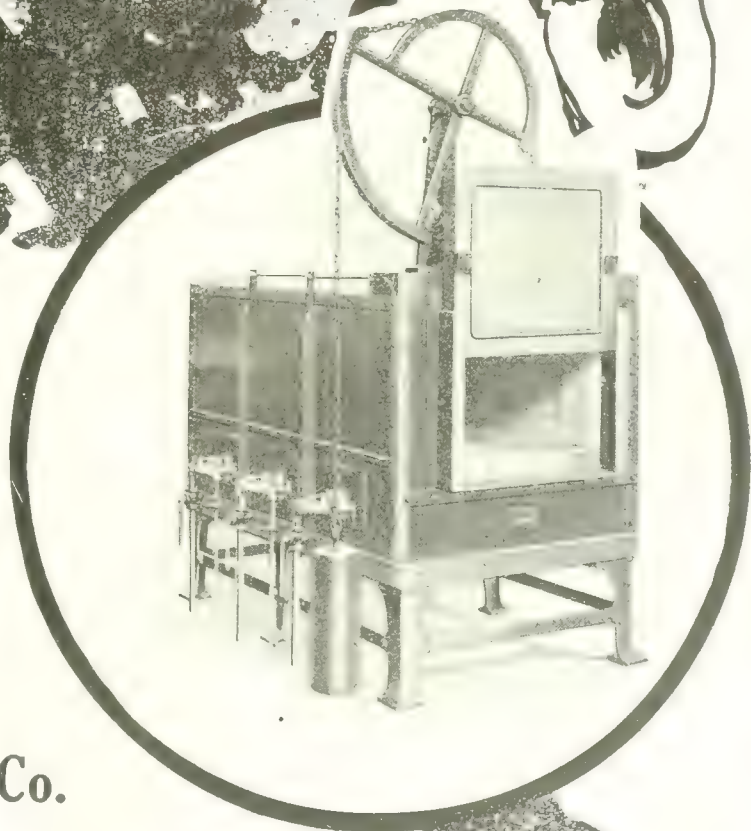
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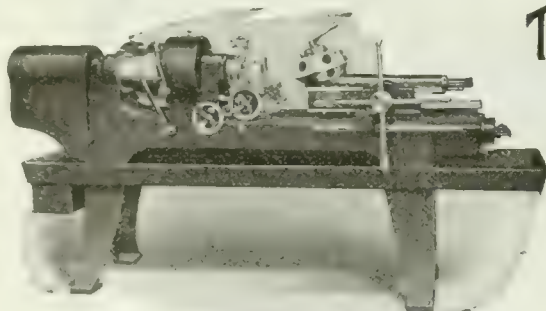
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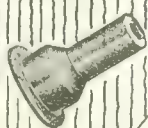
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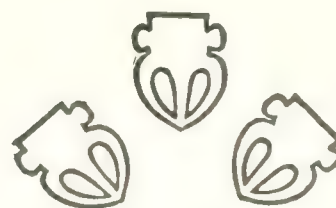
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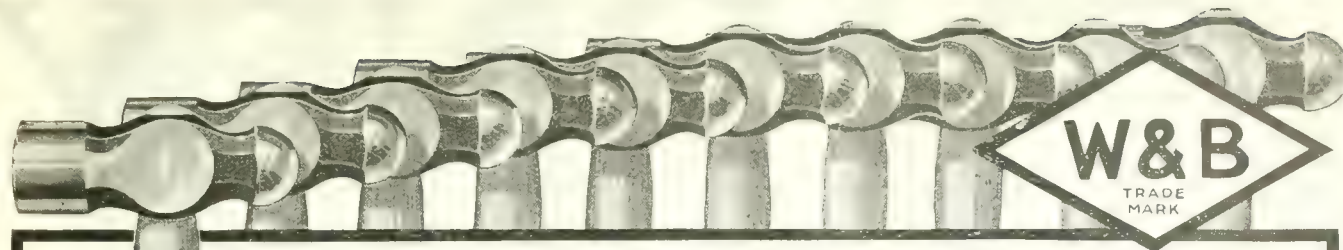
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Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to $\frac{1}{2}$ " thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

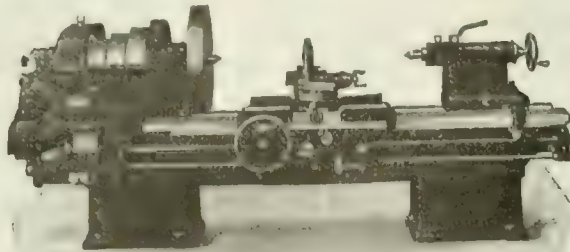
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*Heavy
Duty
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Lathes*

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

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For
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Cutting
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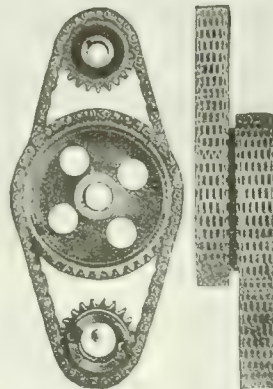


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Large Stocks maintained at convenient distributing centres throughout Canada



**War Record
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**The "Whitney"
Special Quality
"Type M" Chains**

made a great showing
during the war years
1916-17 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

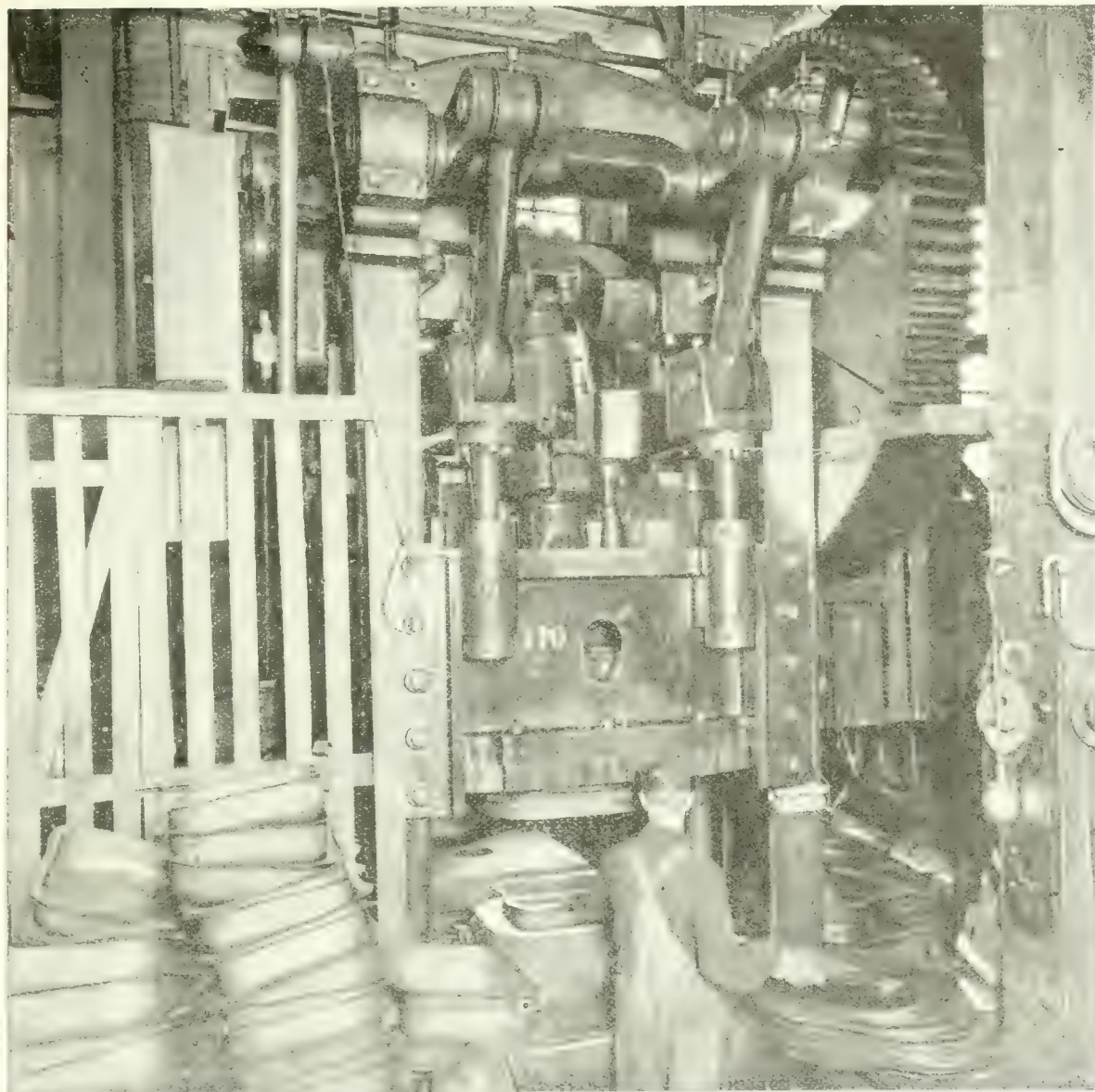
During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

**THE WHITNEY MFG. CO.,
Hartford, Connecticut**



Photograph and data by courtesy of our customer.

Roasters 18 x 12 x 4 1/2 deep from 24 gauge pickled and annealed steel at 350 per hour.

Sold in 1898

A "Bliss" No. 14 Toggle Drawing Press. It is here being run at 7 strokes per minute, the operator catching 85 per cent. of the strokes.

The owners bought their first "Bliss" Press in 1871, and to-day our records show the purchase of 66 "Bliss" presses of various kinds. It is neither

our longest nor greatest record for a single customer, but it has been maintained with characteristically mutual respect and satisfaction.



1857

E. W. BLISS COMPANY

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1919

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DRILLING 38 HOLES OF DIFFERENT DIAMETERS IN ONE OPERATION

The above cut visualizes the great economical possibilities of NATCO Multi-Drillers.

This driller is one of many NATCOS installed in the plant of the Hinkley Motors Corp. It is drilling 38 holes of different diameters in one operation in the bottom of aluminum crank cases.

A patented feature of the NATCO, Independent Change of Speed to each individual spindle, permits drills of various sizes to be driven at approximately their correct cutting speed.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

LET US MAKE YOU PRODUCTION ESTIMATE ON YOUR WORK.

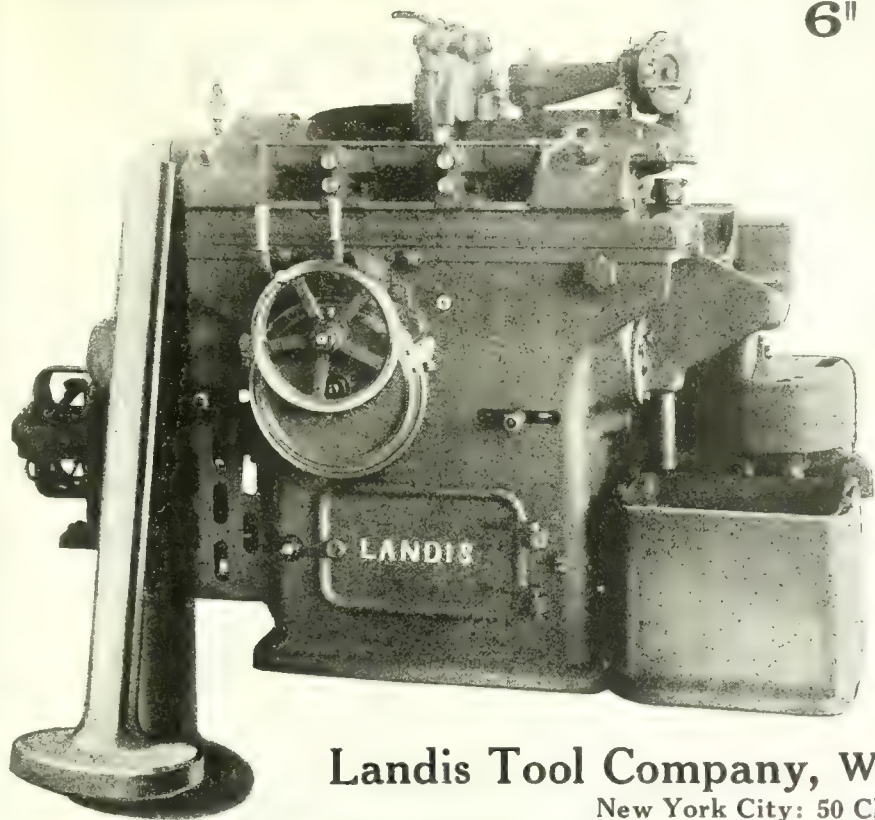
THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U.S.A.

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Allied Machinery Co. of America, Italy, Spain,
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140 Valve Stems per Hour on the "LANDIS" 6" x 18" Grinding Machine



ONE enthusiastic user calls this tool "the biggest little machine on the market." It is a great little producer, compact, sturdy and accurate.

The stems of these valves require finishing within .00025" limits. The Landis does this easily, using a 4-inch face wheel requiring a traverse of only $\frac{3}{8}$ " to cover the stem and at a speed of 140 valve stems per hour.

Landis Tool Company, Waynesboro, Pennsylvania
New York City: 50 Church Street

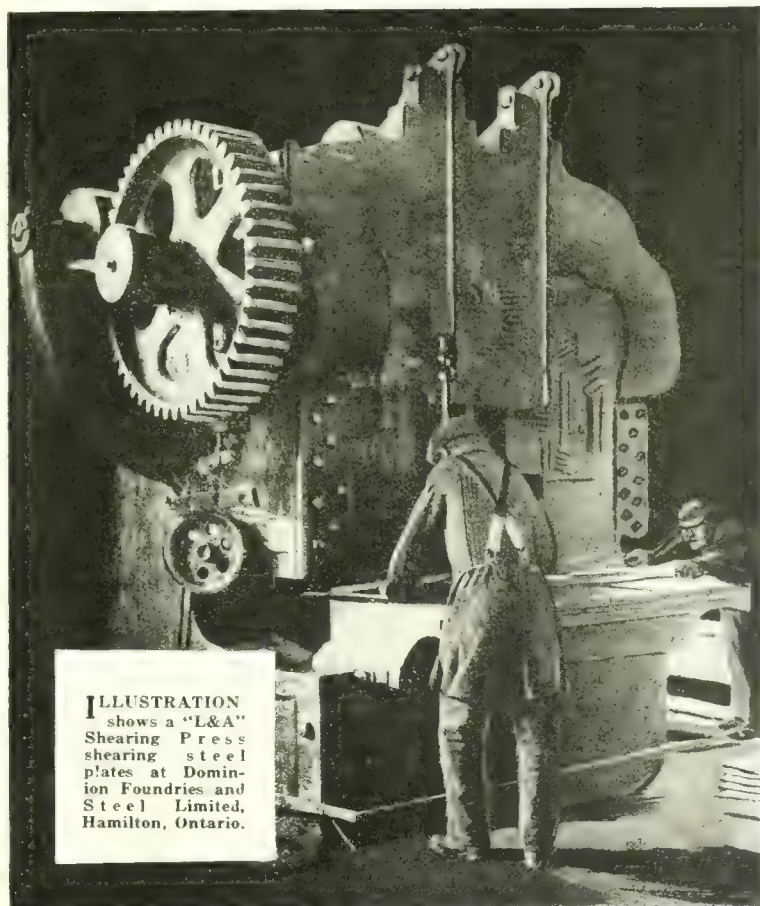


ILLUSTRATION
shows a "L & A"
Shearing Press
shearing steel
plates at Dominion
Foundries and
Steel Limited,
Hamilton, Ontario.

"The Quality Line" PUNCHING and SHEARING MACHINERY

We manufacture "The Quality Line" machinery equipment for Rolling Mills, Bridge and Structural Works, Steel Car Plants and Shipyards. All machines are built of the same high grade workmanship and material that have given the "L & A" product a recognized standard of quality of over 50 years.

Send for our big catalogue.

The Long & Allstatter Co.
American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Canadian Agents:
RUDEL-BELNAP MACHINERY CO., LIMITED,
Toronto, Montreal.

OxyAcetylene Welding and Cutting



Making Sheet Metal
Chemical Tanks by
Prest-O-Lite Process

"Rivetless" Metal Joining Makes Tanks Leak-Proof

HERE is shown how permanently leakproof sheet metal tanks are made by the Prest-O-Lite process. The metal sheets are first cut to shape with a Prest-O-Lite cutting blow-pipe. They are then set in position, and all joints are welded by the Prest-O-Lite process of oxy-acetylene welding. The joints are made stronger, neater, and at less cost than by riveting. All danger of leakage at joints is eliminated.

In repairing as well as in manufacturing the Prest-O-Lite process is literally "blazing the trail" to efficiency and economy. It saves hundreds of thousands of dollars annually in Canadian factories, mines, machine shops—wherever metal or machinery is used.

Prest-O-Lite
PROCESS

Uses both gases (acetylene and oxygen) in portable apparatus. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better work and lower operating cost.

Apparatus consists of an equal pressure blow-pipe, auto-couplings and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe.

Full instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. Write for it.

Address Dept. C-107

**Prest-O-Lite Company
of Canada, Limited**

PREST-O-LITE BUILDING
Corner Elm Street and Centre Avenue
TORONTO

Plants: Toronto, Ont., Merrittton, Ont.
St. Boniface, Man., Shawinigan Falls, P.Q.



World's Largest Makers of Dissolved Acetylene

P X H

TRADE MARK

Taking the Guesswork Out of Files

You don't have to take your files any more on trust since P.H. and Imperial Files have been on the market.

Steel and workmanship are the best that can be procured, and performance and wear are guaranteed.

Your money back without question if they fail to stand up.

We know

"They Cut Faster and Wear Longer"

Let us prove

INGERSOLL FILE COMPANY, LIMITED
INGERSOLL, ONTARIO

**JOHN MORROW SCREW & NUT
COMPANY, LIMITED**

INGERSOLL Sole Distributors ONTARIO

IMPERIAL

TRADE MARK

MARTEN
MACHINE COMPANY
HAMILTON, ONT.

TOOLS

—ACCURACY---RELIABILITY—

OUR REGULAR PRODUCTS:

THREAD GAUGES

SNAP GAUGES

CYLINDRICAL GAUGES

**WE ARE GENERAL AND
SPECIAL TOOL MAKERS**

Let us quote you on your requirements, and have your tools made as you want them made.

WOOD METAL PATTERNS
PATTERNS Hand and Machine

gaging*measuring*

“Just Right —without looking”

That's the point exactly. With Johansson Limit Snap Gages, the operator does not *need* to look. He can feel when the job is between the high and low limits of the snap gage. The “Go” gaging plugs pass over the work, the “No Go” Plugs will not pass over. So, without “reading” anything, he knows the job is “good enough” and will pass the inspector's Johansson Snap as readily as it did his own.

This is the limit system in actual operation. Not a thought of what the work measures. It doesn't matter, so long as it comes somewhere—anywhere between the limits.

When an operator uses a Johansson Limit Gage he does not waste time trying to work to “absolute

dimension.” He simply *gages* his job, keeping in between “Go” and “No Go.” And if the limits have been established in the gages correctly, the work is sure to assemble without further **machining** or fitting. When a part comes out of a machine, it is finished.

To operate the limits system, you need Johansson Adjustable Limit Gages. Twenty-one sizes give all dimensions up to 12 inches. If you are in doubt, let one of our gage experts call upon you and explain.

C. E. Johansson, Inc., 72 Queen St. West,
Toronto:

New York address--245 West 55th St.

Johansson

Dominion Foundries and Steel, Limited

Hamilton Ontario

Steel Products

Open Hearth, Basic and Acid,
Electric and Alloy Steels

Castings

For Ships, Railways, Rolling
Mills, Gears, Machinery and
Ingots to 35 tons

Railway Specialties

Penn Couplers, Bolsters, Truck
Side Frames, Draft Gears

Forgings and Billets

Heavy Ship Forgings,
Locomotive and Car Axles,
Miscellaneous Forgings

Plates

Plates and Heavy Sheets to 30
inches wide, Soft and High
Carbon
Automobile Plates and Sheets

Agricultural Steel

Soft Center and Solid Plow Steel,
Harrow Discs, Shovel Steel,
Cultivator Blades

Sharp Files Increase Men's Interest In Their Job

The man who uses a dull file may work as hard but he cannot work as well as the man with a sharp file.

Tell your men to turn in dull files when they reach the "inefficient point."

"Famous Five" Files stay hard and sharp because they are made of good steel accurately cut and properly hardened.

Specify them when ordering.

They are :



DIES SELF-OPENING

Simple

Few parts — easy adjustments — quick change of chasers — nothing complicated to get out of order.

Strong

Solid one-piece body.
Ample support of chasers.
Positive releasing and setting action.

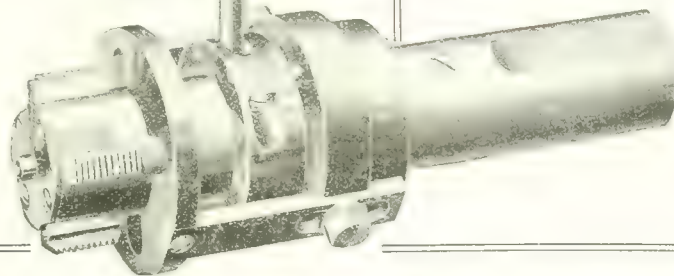
Durable

All parts that are subject to wear are hardened and ground to a precise fit.

Made in Revolving and Non-Revolving types "for every threading requirement."

Quotations on request.

Send for a copy of the new NAMCO Tap and Die Book.



TAPS COLLAPSING

NAMCO Taps embody all those principles essential to the rapid and economical production of clean-cut threads, viz., rigidly held chasers, positive collapsing, withdrawal of tap without injuring thread, and positive re-setting.

It's all in the construction.

Specific quotations on your work.

Capacities— $\frac{7}{8}$ " to $5\frac{7}{8}$ ".

The National Acme Co.

New England Plant Windsor, Vt. Cleveland, O. Canadian Screw Plant Montreal

Branch Offices:

New York Boston Chicago Detroit Atlanta San Francisco
Warehouses New York, Chicago With Foreign Representatives

Makers of Grinders Single and Multiple Spindle Automatic
at Windsor, Vt. and Acme Automatic Threading Dies and
Screw Machine Products at Cleveland, Ohio

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.



Foundry Equipment For Sale

- 1—Henry Pridmore Roll Over Moulding Machine, 22" x 18"—8" drop.
- 1—Henry Pridmore Drop Plate Moulding Machine, 24" x 24"—8" Drop.
- 1—Foot Power Sprug Cutter, depth of throat 10" travel 1", 4" between jaws.
- 1—Foot Power Sprug Cutter, depth of throat 6", travel 1", 1" between jaws.
- 2—No. 275 Monarch Type Furnaces.
- 1—Rockwell Type Furnace, 600 pounds capacity.
- 1—Sherbrooke Machine Co., Roots Type Blower, outlet dia. 10".

Standard Machinery & Supplies, Limited

261 Notre Dame St. West

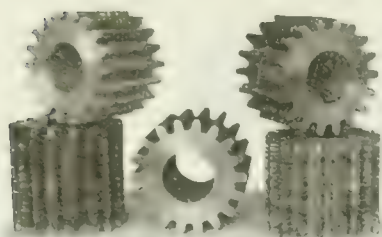
Montreal

Rawhide Cut Gears



Silent in operation
and durable.

Large sizes or small.



Tons

of Rawhide Gear blanks
in stock here
for your convenience.

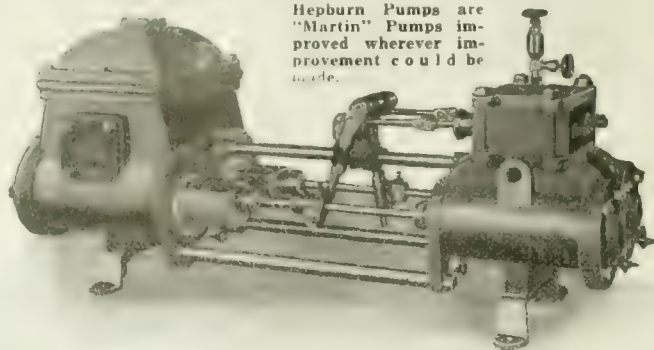
Get our quotations.

Hamilton Gear Co. Ltd.
Van Horne Street - TORONTO

Hepburn Pumping Machinery

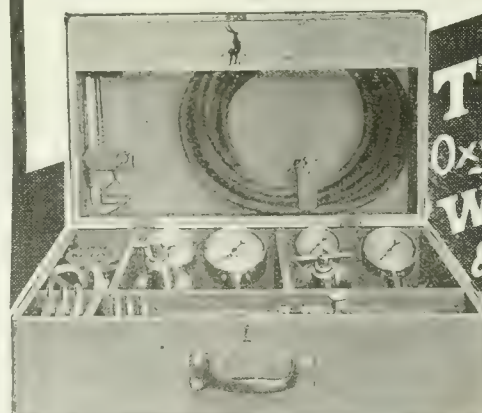
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.



JOHN T. HEPBURN, LIMITED
18-60 Van Horne Street Toronto, Ontario

For Repairing Broken Machinery or Tools of Medium Size



TURNER
Oxy-Acetylene
**WELDING
& CUTTING**
Equipment

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

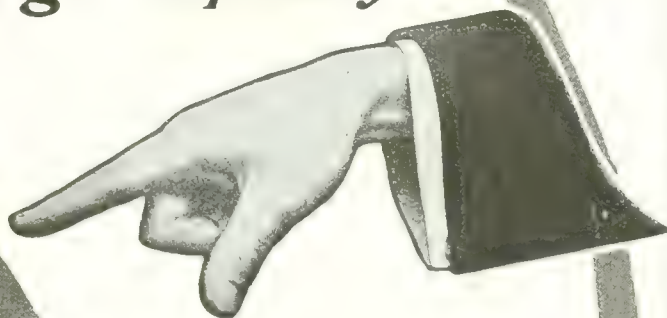
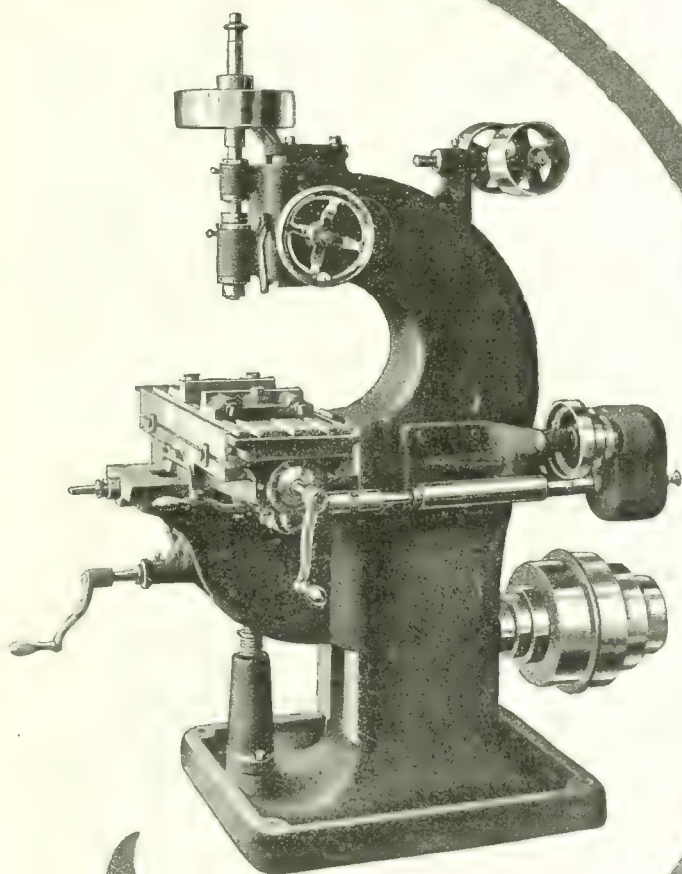
For full particulars write

The Turner Brass Works
SYCAMORE, ILLINOIS, U.S.A.

BRISTOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



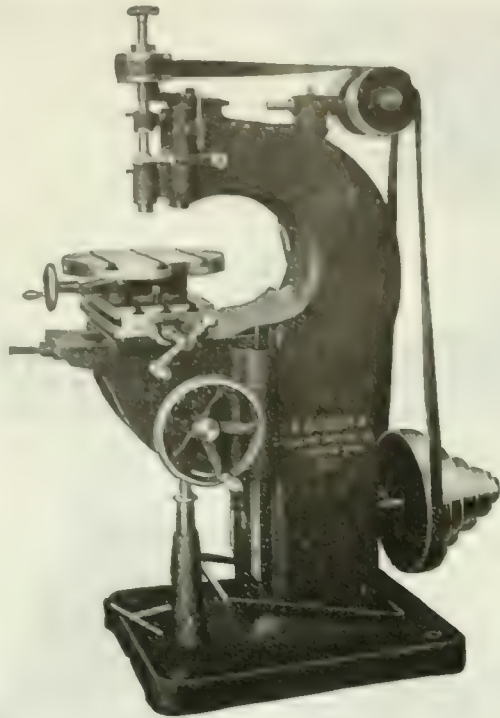
Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.,



"THE MACHINE
THAT GIVES THE
SMOOTH FINISH"

BECKER

BELT DRIVEN

MILLERS

Have no hidden mechanisms in the frame requiring lubrication and there is a conspicuous absence of pilot wheels and crank levers which tend to confuse the operator.

All parts are easily accessible; feed changes are made while the cutter is working, thus enabling the operator to adjust the feed to exactness while under cut.

Write for circular 0-703 to-day.

Becker Milling Machine Co.

HYDE PARK, BOSTON, MASS.

A. R. Williams Machinery Co., Ltd., 64 Front St. W., Toronto
Rudel-Belnap Machinery Co., Ltd., 137 McGill St., Montreal

STEEL CASTINGS

Mild Steel, High Carbon Steel, Manganese Steel, Chrome Steel

We are manufacturers of Steel Castings running from $\frac{1}{2}$ lb. to 5,000 lbs. each and are in good position to furnish prompt deliveries at moderate prices. Try us with your next order.

The Wm. Kennedy & Sons, Limited, Owen Sound

ESTABLISHED 1860

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash*?

Someone may be looking for just the machine you may want to sell. Let us bring you together.

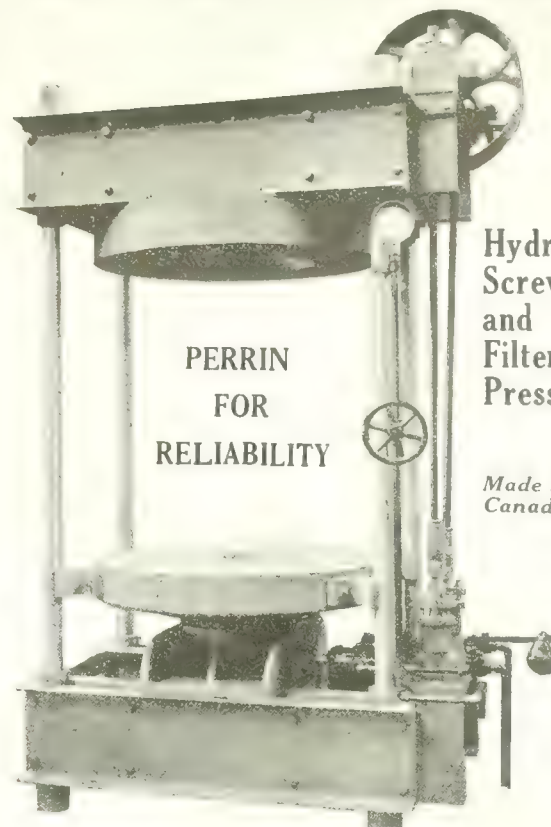
A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY

Classified Advertising Section

143-153 University Avenue TORONTO, ONT.



Hydraulic
Screw
and
Filter
Presses

*Made in
Canada*

PERRIN
FOR
RELIABILITY

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED
TORONTO

Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

"Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery

Classified Advertising Section

143 University Ave., TORONTO

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46
40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8. hole.

EMERY FLOUR AND WASHED FLOUR

EMERY GLASS FLINT GARNET CORUNDUM CARBORUNDUM	PAPER AND CLOTH	IN
		SHEETS, ROLLS,
		DISCS, BANDS,
		STRIPS and
		TAPES, &c.

John Oakey & Sons

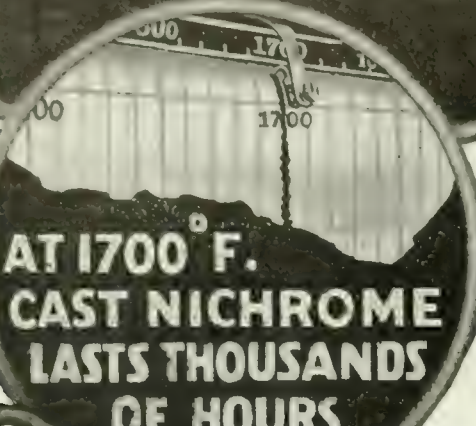
LIMITED

WELLINGTON MILLS

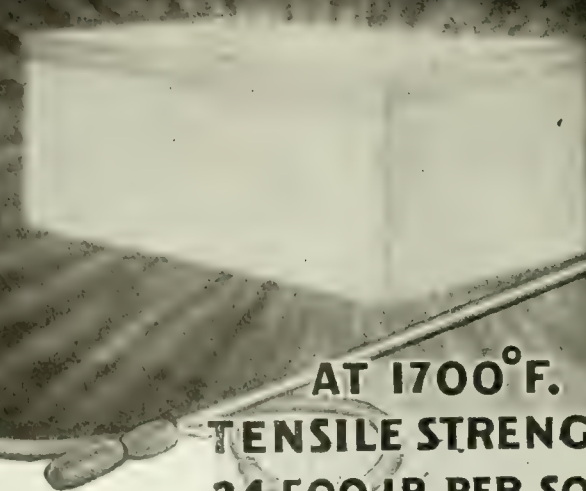
LONDON, S. E. 1., ENGLAND

NICHROME

the Casting Durable



**AT 1700° F.
CAST NICHROME
LASTS THOUSANDS
OF HOURS**



**AT 1700° F.
TENSILE STRENGTH
24,500 LB. PER SQ. IN.**

Annealing and Carburizing Boxes of Cast Nichrome

Being much more durable at high temperatures, boxes made of cast Nichrome are superior to those of cast steel.

A steel box must be made thick to allow for the reduction of thickness caused by scaling or oxidation, each time the box is heated. The walls of a steel box, $\frac{3}{4}$ in. thick, will be only $\frac{1}{4}$ in. thick, or less, after repeated heating.

There is no loss with a Nichrome box, the walls are therefore made thinner, thus increasing the conductivity of heating.

Nichrome is cast in various shapes, and in any weight up to 1200 lbs. It is exceptionally adapted for annealing and carburizing pots, heating retorts, cyanide hardening pots, and lead tempering pots.

Write for further particulars. Manufactured under Henderson Patents.

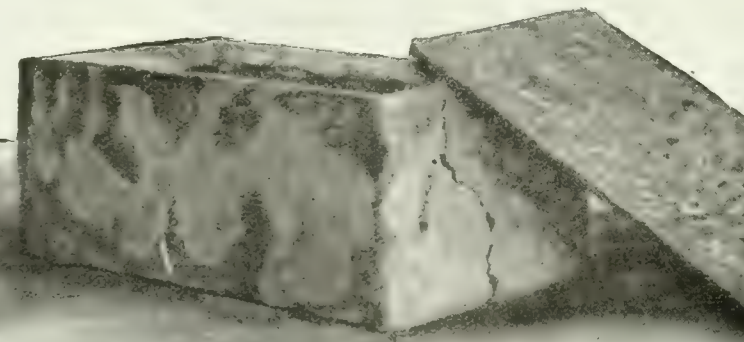
CANADIAN DRIVER-HARRIS Co., Ltd.

WESTERN OFFICE AND WORKS
CHICAGO
20 N. JEFFERSON ST.

WALKERVILLE, ONT.

CANADA
AMERICAN OFFICE AND WORKS
HARRISON, N. J.

BRITISH WORKS
MANCHESTER
ENGLAND



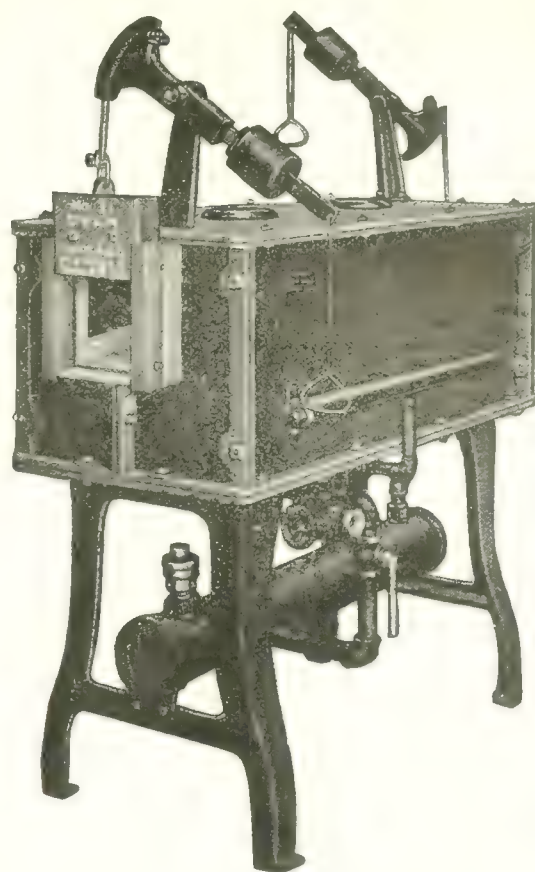
**AT 1700° F.
CAST IRON CRACKS,
GROWS, SCALES
AND WARPS
AND LASTS ABOUT
200 HOURS**

Heat-Control of Stewart Oven-Furnaces

War-taught lessons in scientific metallurgy abolished the "rule-of-thumb"—once for all.

The pyrometer, not the "wizardry" of the self-satisfied color-expert, is now in charge.

This new order-of-things calls for Heat Treating, annealing and carbonizing furnaces that permit of



Accurate Control of Temperatures

And Stewart Indirect-Heat Furnaces are equal to the most rigid requirements in this direction.

This control is partly a matter of scientific and accurate mixing of gas and air before it is admitted to the combustion chamber.

Partly due to the placing, spacing and direction of the non-carbonizing Burners used on all Stewart Furnaces.

Partly to the scientific relationship of chamber-area to port-hole areas.

Partly to the shape and position of Hearth.

Partly to the fact that the quality and thickness of our linings and the sturdy strength of our frames and casing all contribute to the permanent *tightness* of Stewart Furnaces.

All these, and many other features—in combination—place Stewart Furnaces in a class by themselves: recognized for their accuracy, dependability, and great endurance.

Send for our New Catalog and get the whole story

CHICAGO FLEXIBLE SHAFT CO.

1148 So. Central Ave.

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CHICAGO

—CONSOLIDATED—

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

CONSOLIDATED
POWER
PRESSES



—CONSOLIDATED—

For trimming, stamping, forging, punching, embossing.

Special presses are designed where the customer's requirements are unusual.

CONSOLIDATED
POWER
PRESSES

CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN
U. S. A.

One Customer Says:

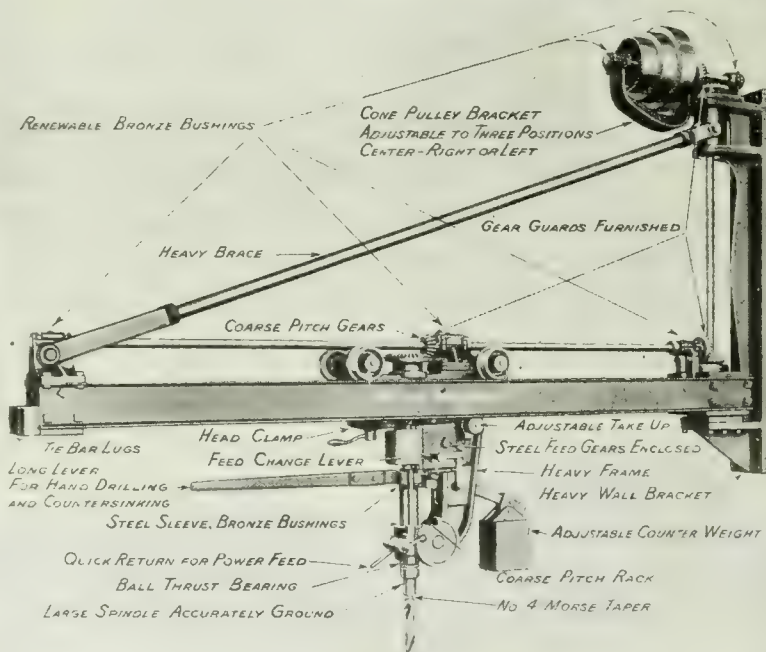
"These machines were put in operation immediately upon arrival, have been producing ten hours per day every day since, and we have never experienced a bit of trouble with same." We know you will appreciate what this means in any shop, and believe this is the sort of machine you are looking for. We consider the machine the finest in its line on the market to-day, and believe an installation would save money for you in the cost of your production.

Our illustrated bulletin will interest you, giving detailed information.

MADE IN FOUR STANDARD SIZES

Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue

BOSTON, MASS.

THE LATHE WITH THE PULL

THE LATHE OF SIMPLIFIED ACCURACY

Will prove its economical worth to any user.

We invite comparison in swing, weight and accuracy.

We know of no simpler operated Lathe made.

No overhang to any style.

.005 in 18" or better.

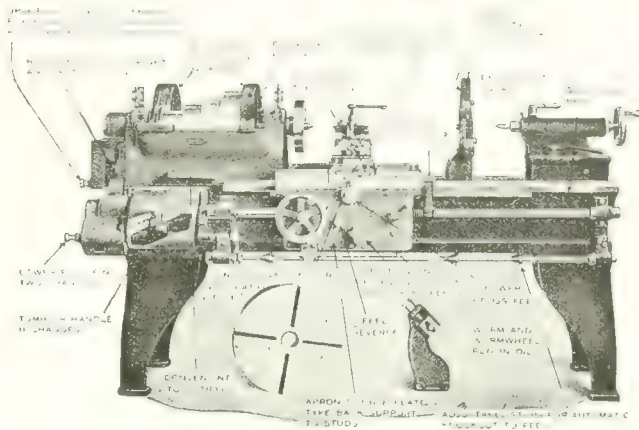
No waste material.

Only 3 levers in head.

Repairs practically nil.

Everything proportionate.

Drop-forged or European tool posts.



CISCO 14 and 16-inch Engine Lathe

The Cisco Machine Tool Company, Cincinnati, U.S.A.

Builders of 14"-16"-18"-20"-24" Engine and Tool Room Lathes, Cone or Motor Driven, Belt or Motor Driven Geared Head

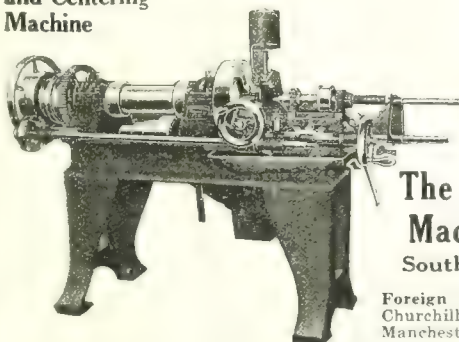
One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools, one cutting up and the other cutting down; each holding the work against the other. What is the result?—the production is doubled and the cost is cut in half. Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

Hurlbut,
Rogers
Cutting-off
and Centering
Machine



**The Hurlbut, Rogers
Machine Company**

South Sudbury Mass.

Foreign Agents England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow, Newcastle-on-Tyne.

60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.

And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

GRANT

Rivet Spinning
Machines

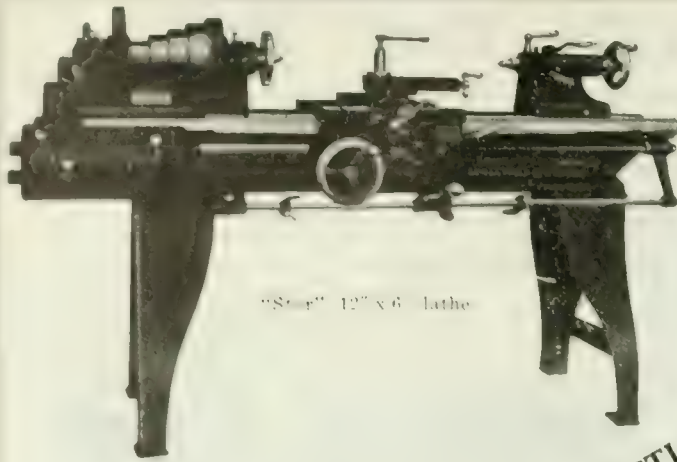
Handle any rivet up to 1 1/2 in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Proper Riveting" tells how to give an extra appearance of quality to your product. For your copy

Write to-day

GRANT MFG. & MACHINE COMPANY

85 Silliman Avenue, Bridgeport, Conn.





"Star" 12" x 6' lathe

9-11-12-13 swing
with a full line of
attachments.

Economical in first cost,
operation, maintenance
and floor space.

36 YEARS OF PERFECTION IN SMALL LATHES

"STAR" LATHES

THE SENECA FALLS MFG. CO., INC., 366 W. Fall St., Seneca Falls, N.Y.



The ideal equip-
ment for Tool
Room, Accurate
Manufacturing Produc-
tion, Training Schools
and all classes of accurate,
high-class work.

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

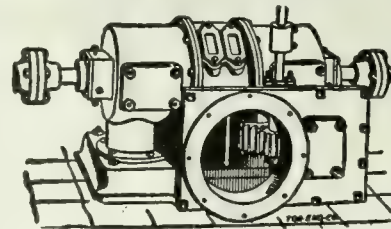
Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN



WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

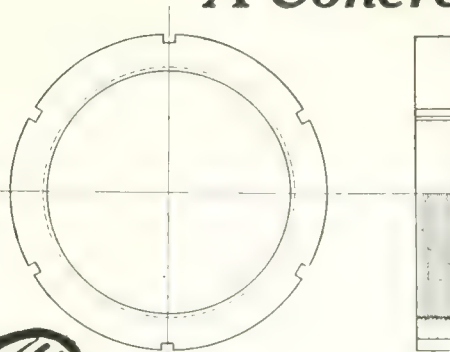
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

J. C. WILSON & CO.
BELLEVILLE, ONTARIO

Smalley-General Thread Miller Saves Time on Main Spindle Nut Work

A Concrete Example



A vital factor in competition to-day is speed in production. You need the Smalley-General Thread Miller for quantity work. Speed, convenience and accuracy are the features of this modern cost-cutter. The following time-study illustrates what it will do:

MACHINE—Smalley-General Thread Miller No. 2.

PIECE MACHINED—Main spindle nut.

THREAD—Diameter, 8"; length, 1 1/4"; 8 pitch U.S. Standard.

1. Work chucked.
2. Threaded surface milled from rough.
3. One side faced.
4. Put on mandrel. Turn other face and outside.

TIME—Milling operation, 1 min. 45 sec. Milling feed, 14.3" per min.

MATERIAL—Cast iron.

TOTAL TIME in thread miller, floor to floor, 3 1/4 min.

NOTE—Smalley-General Thread Miller Method involves no more chuckings than in a lathe and saves much time. Also quality of work better.

Let us tell you more about the "Smalley."

Smalley - General Company, Inc.
Bay City, Michigan

Canadian Agents—Rudel-Belmap Co., Limited, Montreal and Toronto.

SPECIAL TOOLS

Automatic Machinery
for all purposes

Punch Press Work

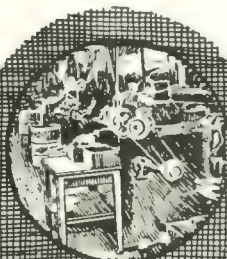
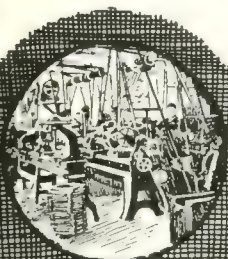
Screw Machine Products

Consult us on your machine problems

Toronto Tool Company

516 Richmond St. West

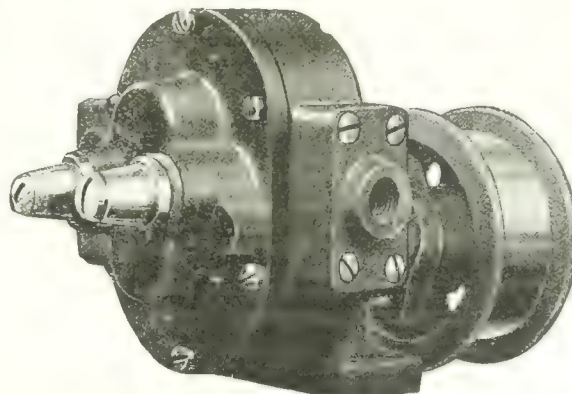
Phone Adel. 1181



Lubricant



Pumps



**The
PUMP
That
OUTLIVES
the
MACHINE**

TRAHERN Rotary Geared Lubricating Pumps are for use on metal working machines of all kinds. They are especially constructed to operate at low speed (300 to 500 R.P.M.) thus obtaining minimum wear and very long life. They will shoot forcefully any quantity of coolant at will of operator up to 16 1/2 gallons per minute.

Investigate.

Ask for Bulletin 44.

TRAHERN PUMP CO.
ROCKFORD, ILL., U.S.A.

HINTS TO BUYERS

DARLING BROTHERS, LIMITED

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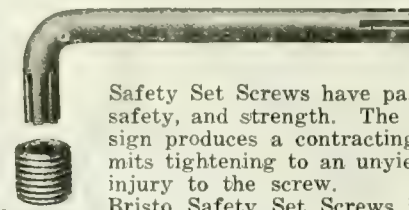
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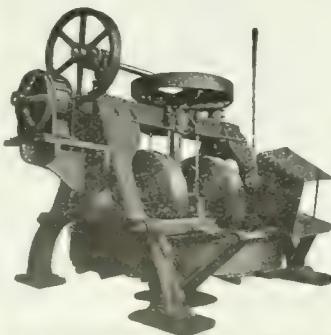
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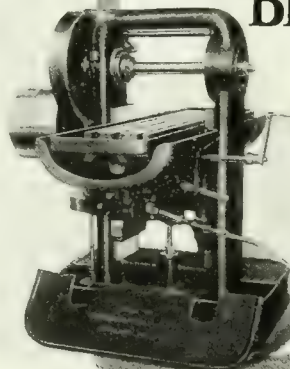


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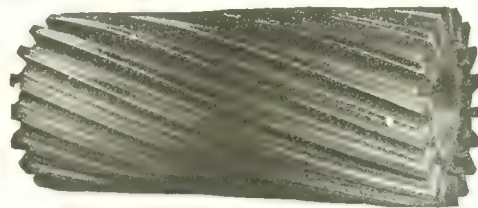
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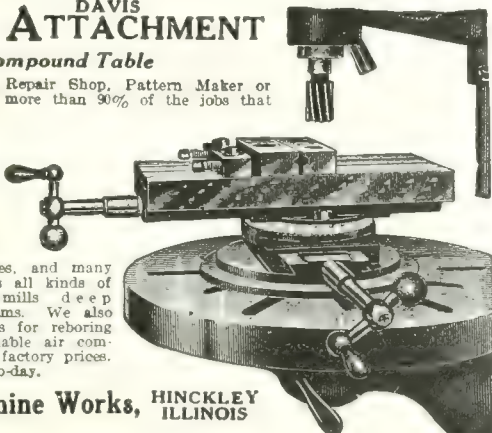
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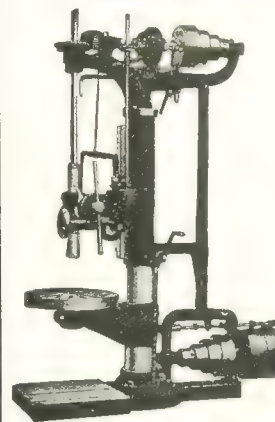
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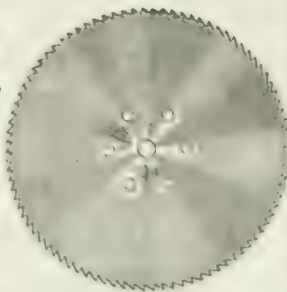
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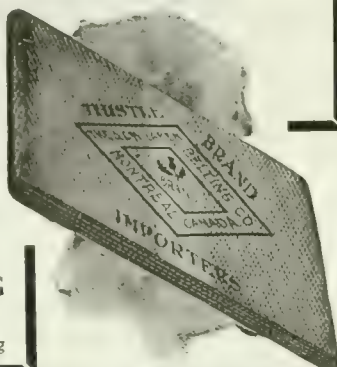
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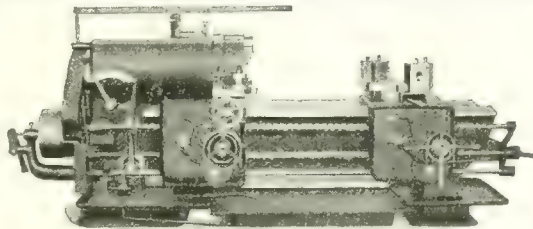
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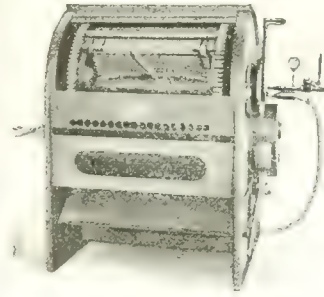
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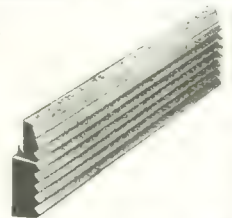
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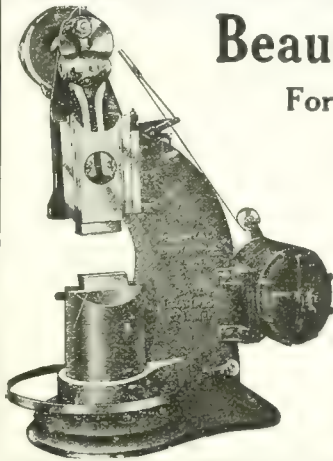
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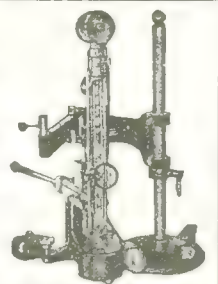
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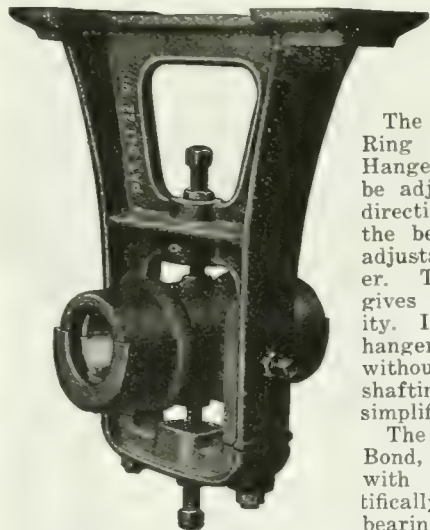
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Greenfield Tap & Die Co., Greenfield, Ont.

BOOKS, TECHNICAL

MacKinnon Steel Co., Sherbrooke, Que.

BOILERS

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MacKinnon Steel Co., Sherbrooke, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BOLT CUTTERS AND NUT TAPERS

Armstrong, Whitworth, et Can., Montreal, Que.
Carahan, Farnham, Moss Co., Montreal, Que.
Greenfield Tap & Die Co., Greenfield, Ont.
Hawthorne, Bros. Co., Boston, Mass.
Niles-Rement, Pond Co., New York, U.S.A.
Rex, Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOLTS

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Cleveland Twist Drill Co., Cleveland, Ohio, U.S.A.
Frost Smith Machine Co., Hamilton, Ont.
Wagon & Co., J. C. Belleville, Ont.
Garlock, Walker, Mach. Co., Toronto, Ont.
Morse, Twist Drill & Mach. Co., New Bedford, Mass.

BOLTS, STAY

Algonia Steel Corp., Sault Ste. Marie, Ont.

BOLTS, SPRING SHAKLE

Can. Winkley Co., Ltd., Windsor, Ont.
Morrow, Screw & Nut Co., John, Ingersoll, Rochester, N.Y.

BOLTS, PATCH

Algonia Steel Corp., Sault Ste. Marie, Ont.

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Cleveland Twist Drill Co., Cleveland, Ohio, U.S.A.
Frost Smith Machine Co., Hamilton, Ont.
Wagon & Co., J. C. Belleville, Ont.
Garlock, Walker, Mach. Co., Toronto, Ont.
Morse, Twist Drill & Mach. Co., New Bedford, Mass.

BOLT THREADING MACHINERY

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Cleveland Twist Drill Co., Cleveland, Ohio, U.S.A.
Frost Smith Machine Co., Hamilton, Ont.
Wagon & Co., J. C. Belleville, Ont.
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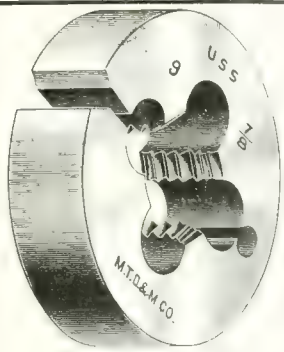
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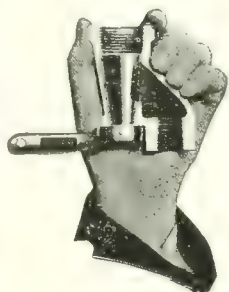
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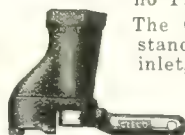
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Everything required from "Pipe Line" to "Air" Tool
All Fittings Furnished are Interchangeable and Air-Tight



CLECO AIR-SEATED VALVES

The CLECO Air Valve has but three parts: Body, Valve Plug and Handle; no Packing required, has Waste arrangement.

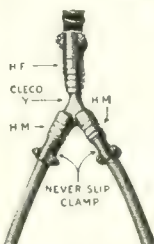
The CLECO Valve, style P.O., is made in sizes ½-inch to 1½-inches, with standard pipe thread. Style F.O. is made in one size only; 1-inch pipe thread inlet, and ¾-inch Female Bowes Coupling Outlet and is interchangeable with Male Ends from ¼-inch to ¾-inch.



CLECO "Y" HOSE FITTINGS

The Hose Section illustrated shows "Y" Fitting connected. The "Y" permits use of two Leader Hose Lines and Two Air Tools. Designed for Ship Yards use. Are made in four styles with Male or Female Outlets or Inlets and interchange with Bowes Male or Female coupling ends; sizes ¼-inch to ¾-inch inclusive. The two "Y" fittings illustrated are the plain style. The other two styles are each equipped with a valve having same features as Cleco Air Valves described above.

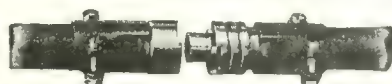
Y-Fittings may also be used in Boiler and Locomotive Shops.



BOWES AIR HOSE COUPLINGS

Standard Equipment Everywhere.

The Bowes is instantly connected or disconnected by ¼-turn.



The Bowes is absolutely Air-Tight under all pressures.

Write for Bulletin 34A, 41 and 43

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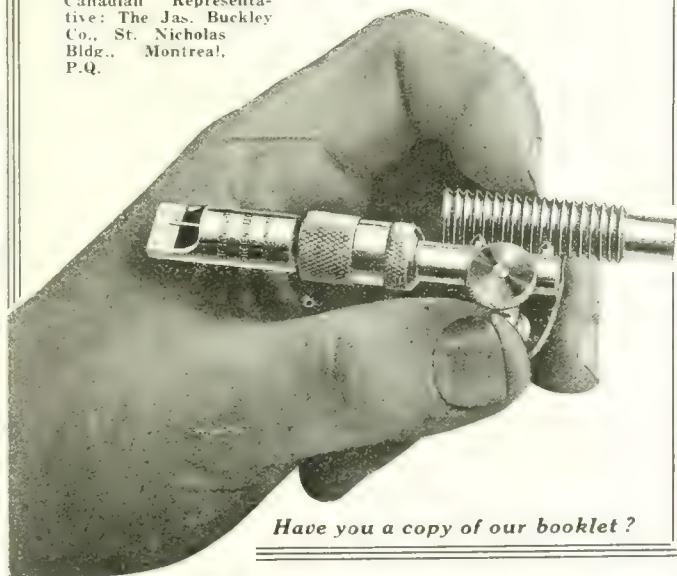
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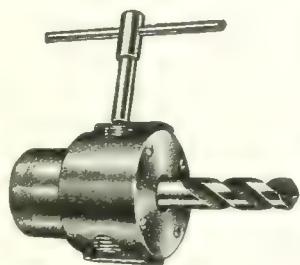
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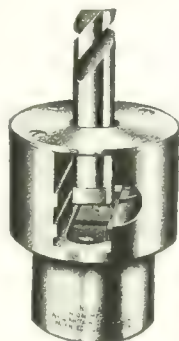


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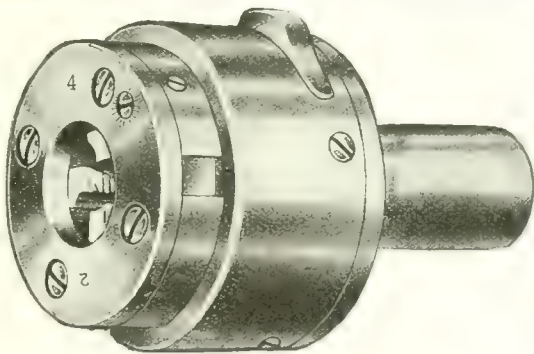
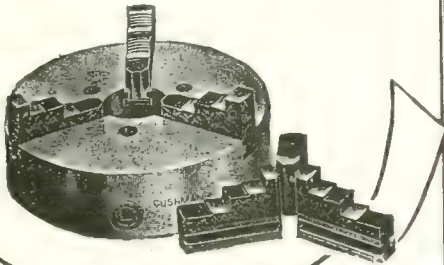
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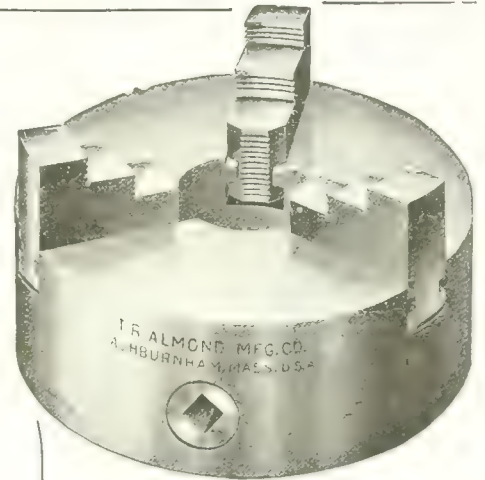
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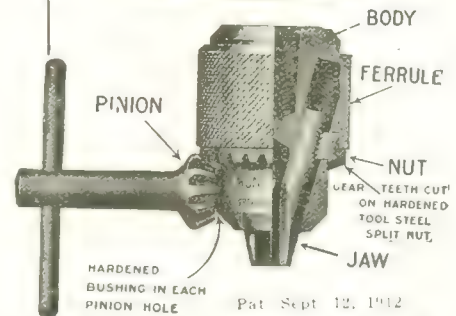
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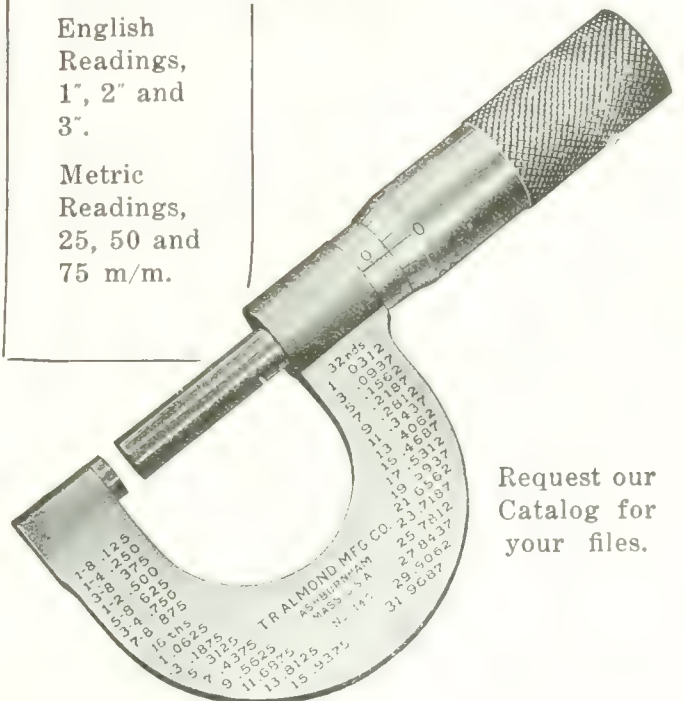
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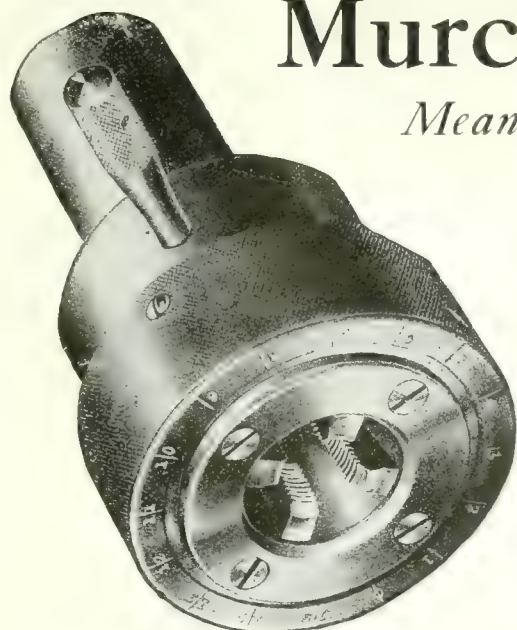
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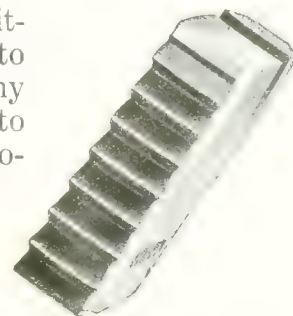
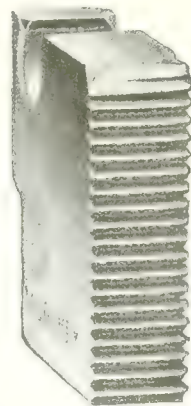
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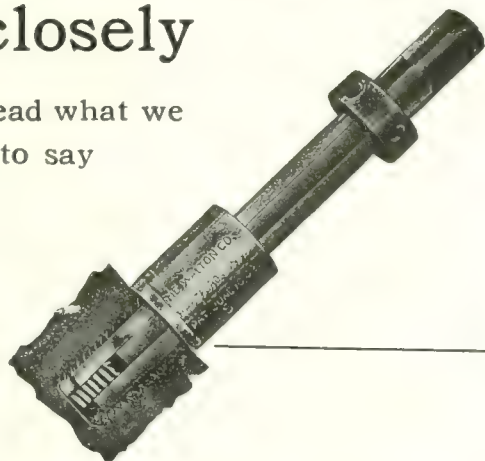
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Hartford, Conn.

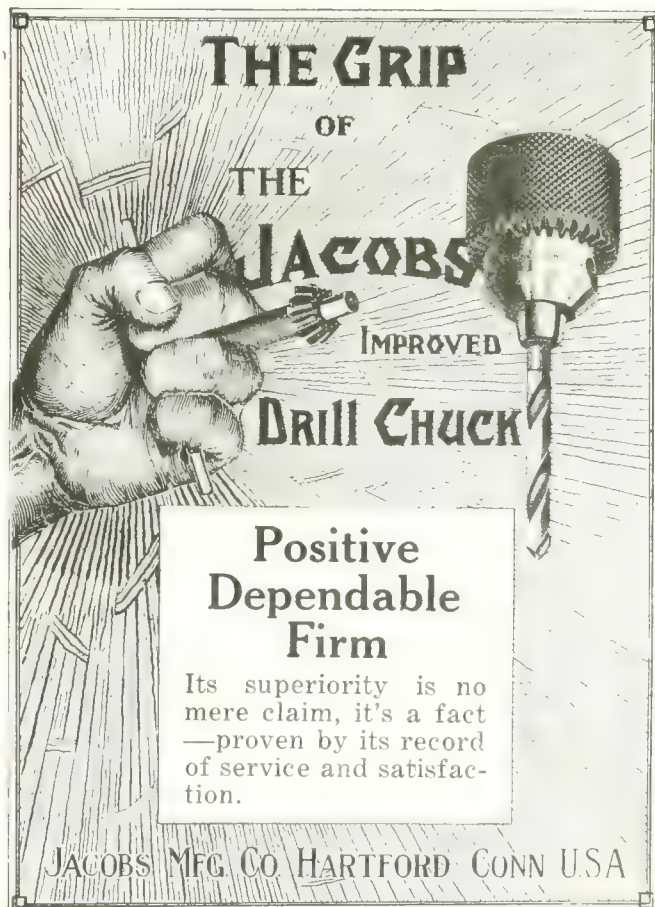
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MACHINERY, HAMMER AND NAIL
Garlock-Walker Machy. Co., Toronto, Ont.

MACHINERY GUARDS (See Guards)
MACHINERY REPAIRS

Marion Mach. Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, MULTI-DRILLING
National Automatic Tool Co., Richmond, Ont.

MACHINERY, TRANSMISSION (POWER)
Mass Cham. Co., Platts, New York

MACHINES, BELT-LACING
Chapman Belt Lacer Co., Grand Rapids

MACHINES, ROLLING, BENDING
Steel Co., Inc., Ph. D. H., Buffalo, N.Y.

MACHINES, RUNNING, BALANCING
Norton Grinding Co., Worcester, Mass.

MACHINES, MULTI-BORING
National Automatic Tool Co., Richmond, Ont.

MACHINES, SHOP WORK
Rafferty-James, Montreal

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES

Can. Fairbanks-Morse Co., Montreal
Marion Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
MacGovern & Co., Montreal, Que.
Stewart Co., L. S., Athol, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MACHINE TOOLS
Williams & Wilson, Ltd., Montreal, Que.

MACHINE AND REPETITION WORK

Kato Feeds, Ltd., Galt, Ont.

MANDRELS

Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Jardine & Co., A. B., Hespeler, Ont.
Mass. Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Pritchard-Andrews Co., Ont. Ottawa
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY

Brown, Briggs Co., Hamilton, Ont.
Fox Machy. & Sply Co., G. F., Montreal
Peerin Wm. R., Toronto
Williams & Wilson, Ltd., Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.

Strong, Kennard & Nutt Co., Cleveland

MEASURING MACHINES

Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING

Bowser & Co., S. F., Inc., Fort Wayne

MEASURING TAPES AND RULES

Chesterman & Co., Jas. L., Ltd., Sheffield

METALLURGISTS

Toronto Testing Laboratory, Ltd., Toronto

METAL SAWS

Simonds Mfg. Co., Fitchburg, Mass.
Hoefler Mfg. Co., Freeport, Ill.

METAL SAWS, POWER

Hoefler Mfg. Co., Freeport, Ill.

METALS

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Dom. Iron & Wrecking Co., Ltd., Montreal
Emmshewsky & Son, N. Y., Toronto, Ont.
International Metal & Trading Co., Montreal
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Splys, Ltd., Montreal
United Brass & Lead, Ltd., Toronto

METAL, STAMPS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS

Can. Cartridge Co., Hamilton, Ont.

METERS, WATER

Can. Cartridge Co., Hamilton, Ont.

METERS, OIL, CASO-VINE, KEROSENE, ETC.

Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS

Almond Mfg. Co., P. R. Ashburnham, M.
E. J. & M., 318 St. Clair Bldg., Toronto
Williams & Wilson, Ltd., Montreal, Que.

MILLS, SAND

First Mfg. Co., Chicago, Ill.

MILL MACHINERY

Almond Mfg. Co., Ltd., Ottawa
Greenfield Tap & Die Corp., Greenfield,
Wells Bros. of Canada, Galt, Ont.

MILLING ATTACHMENTS

Becker Milling Machine Co., Boston, Mass.
Bilston & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
First Smith Mach. Co., Hamilton, Ont.
Fox Machy. & Sply Co., G. F., Montreal
Harding Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Hutchinson Machine Works, Huxley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Dundas, Ont.
Taft-Pierce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilston Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS

Adams & Co., Ltd., Wm. Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunn, Toronto
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Harding Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto
United States Mach. Tool Co., Cincinnati
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Becker Milling Machine Co., Boston, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence
Chesterman & Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machy. & Sply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Gale & Edmund, Cortland, N.Y.
Harding Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Becker Milling Machine Co., Boston, Mass.
Bilston Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machy. & Sply Co., G. F., Montreal
Fox Machy. & Sply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garrin Machine Co., New York
Gooler & Edmund, Inc., Cortland, N.Y.
Harding Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE

Brown & Sharpe Mfg. Co., Providence
Can. Fairbanks-Morse Co., Montreal
Fox Machy. & Sply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garrin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Taber Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS

Can. Fairbanks-Morse Co., Montreal
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Stedmans Ltd., Galt, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal
Williams Machy. Co., A. R., Toronto
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND

First Mfg. Co., Chicago, Ill.

MODEL WORK

Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
L. & S. M., Danam & Mott Co., Ltd., Toronto
MacGovern & Co., Montreal, Que.
Williams Machy. Co., A. R., Toronto
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Cleveland Pneumatic Tool Co. of Canada, Toronto

MOULDS, RUBBER

Elliott & Whitehall Mch. & Tool Co., Galt

MULTIPLE INDEX CENTRES

Garrin Machine Co., New York

MULTI-DRILLING MACHINERY, VERTICAL AND HORIZONTAL
Nat. Automatic Tool Co., Richmond, Ind.

MULTI-BORING MACHINES
Nat. Automatic Tool Co., Richmond, Ind.

MULTI-TAPPING MACHINERY, VERTICAL AND HORIZONTAL
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NAILS

Graham Nail Works, Operated by Canada Metal Co., Ltd., Toronto
Page Steel & Wire Co., Adrian, Mich.

NAIL SETS

Morrow Screw & Nut Co., John, Ingersoll

NAIL MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville

NICKEL

Baker & Co., Inc., H., Montreal, Que.

NICKEL SILVER

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL

Comstock, J. F. A., New York City, N.Y.
Kaiser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal

NIPPLE HOLDERS

Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford
Landis Machine Co., Waynesboro, Pa.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Morrow Screw & Nut, Ltd., J., Ingersoll
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
United Brass & Lead Ltd., Toronto
Wilkinson & Kompass, Hamilton

NUT Burring MACHINES
National Machy. Co., Tiffin, Ohio

NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio

NUT FACING AND BOLT SHAVING MACHINES
Garrin Machine Co., New York
National Machinery Co., Tiffin, Ohio
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garrin Machine Co., New York
Greenfield Tap & Die Corp., Greenfield

Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal
Sheddons, Ltd., Galt, Ont.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carbondum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS

Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS

Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

Ovens for Baking, Bluing, Drying, Enameling, Japaning and Lacquering
Brantford Oven & Rack Co., Brantford

Ovens for Drying, Tempering and Oxygen, Electrolytic Cells Under Trucks
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford

OXY-ACETYLENE WELDING AND CUTTING
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland

PACKINGS, LEATHER, HYDRAULICS, ETC.
Carter & Co., Ltd., J. R., Montreal
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Perrin, Ltd., William, Toronto

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Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
Page Steel & Wire Co., Adrian, Mich.

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MARKERS' LATHES
Oliver Machy. Co., Grand Rapids, Mich.

PATTERN MAKERS' VISES
Oliver Machy. Co., Grand Rapids, Mich.

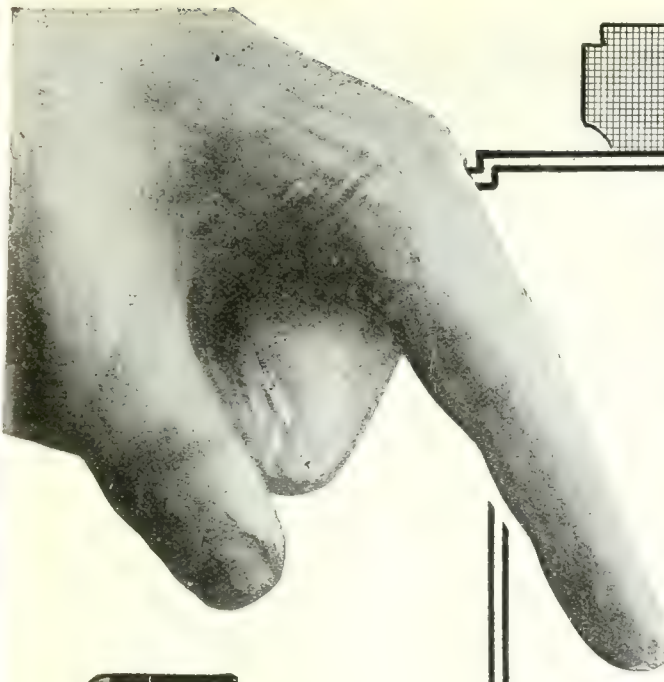
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Budden, Hanbury A., Montreal
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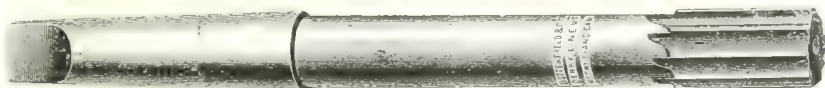
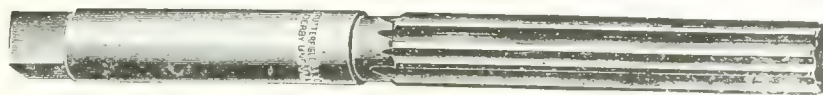
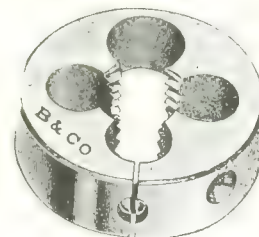
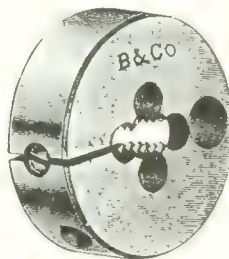
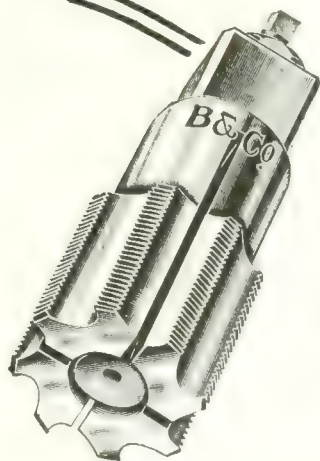
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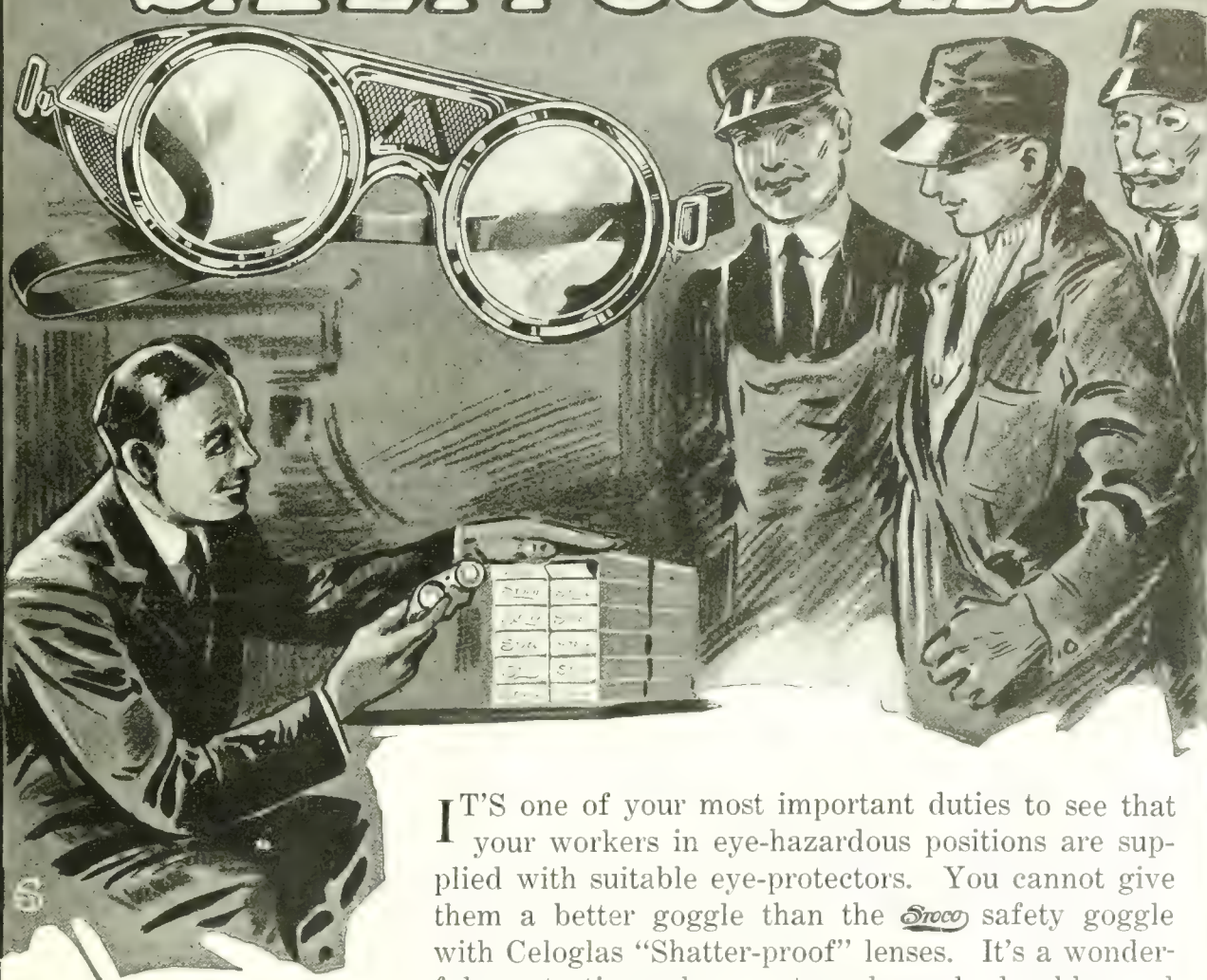
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C. J. & Co., 105, Montreal, Que.
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Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

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Wells Bros. of Can., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

REAMERS, EXPANDING

Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN

Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

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Garvin Machine Co., New York.

REAMERS, TAPER, BRIDGE

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Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

REAMERS, JOBBERS

Morrow Screw & Nut Co., John, Ingersoll.

REAMERS, PIPE, SHELL

Greenfield Tap & Die Corp., Greenfield,
Morrow Screw & Nut Co., John, Ingersoll,
Wells Bros. of Can., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto.

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Gisault Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.

American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC

Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE

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Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS

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RIVETS, TUBULAR, BIFURCATED

Parmenter & Bulloch Co., Gananoque.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETS, IRON, COPPER, BRASS

Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION

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Can. Rogers-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Can., Toronto.

Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW

Grant Mfg. & Machine Co., Bridgeport.
High Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
E. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT

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RODS, ROPE AND SPRING

General Steel Co., Milwaukee.

RODS, PURE NICKEL, MONEL METAL, NICHROME

Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS

Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING

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Brown, Rogers Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROPE, GALV., MONEL METAL, BRONZE

Can. Driver-Harris Co., Ltd., Walkerville.

ROPE, TILLER AND SASH CORD

Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS

The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS

Electric Steels & Metals, Ltd., Welland.

ROLLS, CRUSHING

Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES

Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY

Betrams Ltd., Edinburgh, Scotland.

RULES

Brown & Sharpe Mfg. Co., Providence.
James Chisholm & Co., Ltd., Sheffield.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING

Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING

Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG

Lufkin Rule Co. of Can., Windsor.

SAW MILL CONVEYORS

Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES

Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS

First Mfg. Co., Chicago, Ill.

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SAND BLAST MACHINES

Pangborn Corporation, Hagerstown, Md.

SAND BLAST SUPPLIES AND ACCESSORIES

Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES

Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES

T. A. Wilson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES

Pangborn Corporation, Hagerstown, Md.

SAND MIXING MACHINERY

First Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS

Pure Sanitary Drinking Fountain Co.,
Haverhill.

SANDING MACHINES

Canada Machinery Corp., Galt.

SAW MILL MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Mach. Co., St. Louis.
A. R. Williams Machy Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS

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SAWS, CIRCULAR METAL

Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Plews Ltd., Winnipeg, Man.
Simonds Mfg. Co., Pittsburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

Hunter Saw & Mach. Co., Pittsburgh, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

SAW SHARPENERS

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING

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SCALES, MECHANICS'

Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES

Strong Instrument & Mfg. Co., New York.

SCREENING MACHINERY

Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS

Cleveland Twist Drill Co., Cleveland.

SCREW MACHINE PRODUCTS

Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
United Brass & Lead, Ltd., Toronto.

SCREW MACHINES, HAND, AUTOMATIC

Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
H. C. Dodge, Inc., Boston, Mass.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turnet Mach. Co., Bazel, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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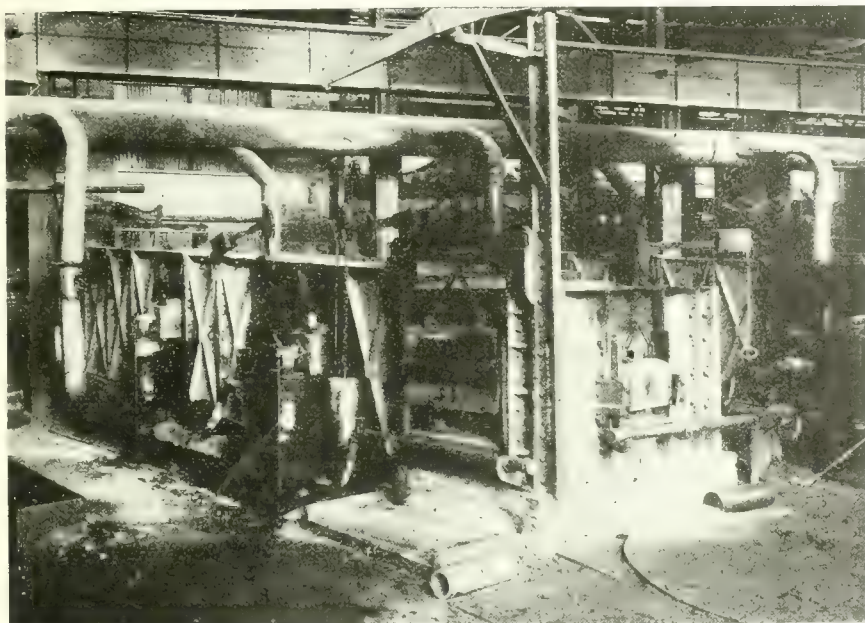
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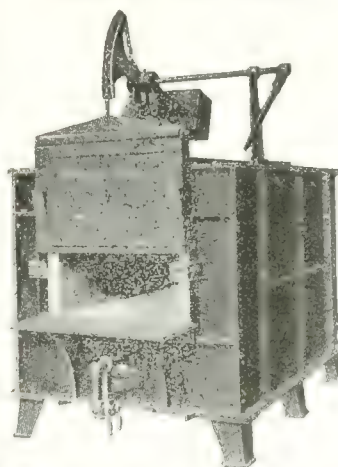
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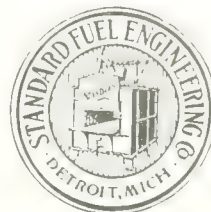
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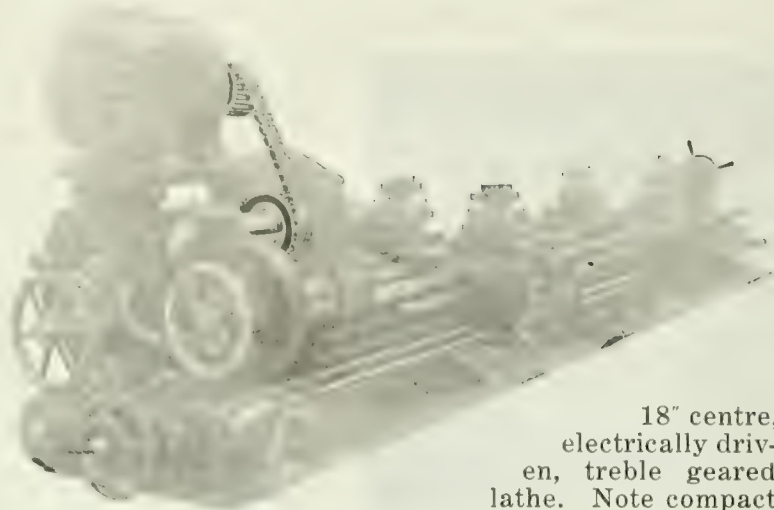


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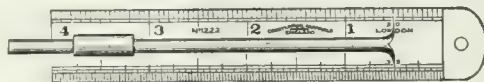
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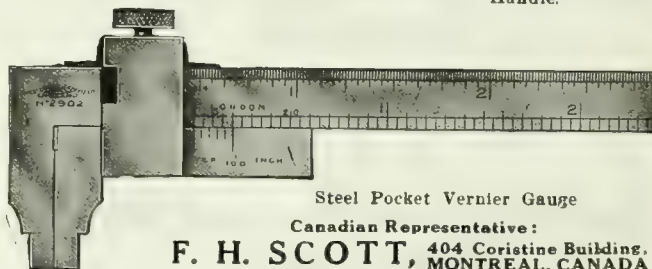
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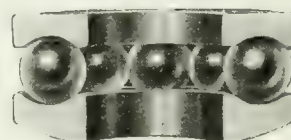
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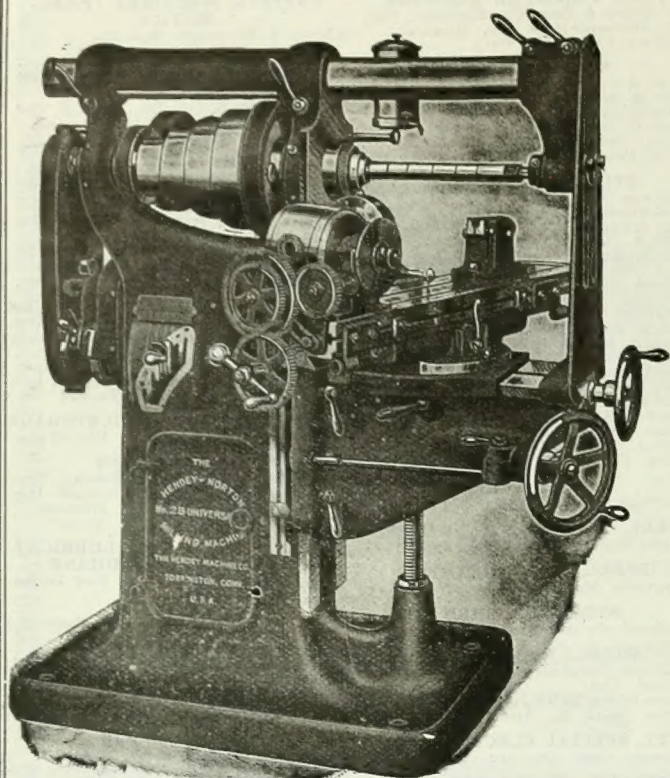
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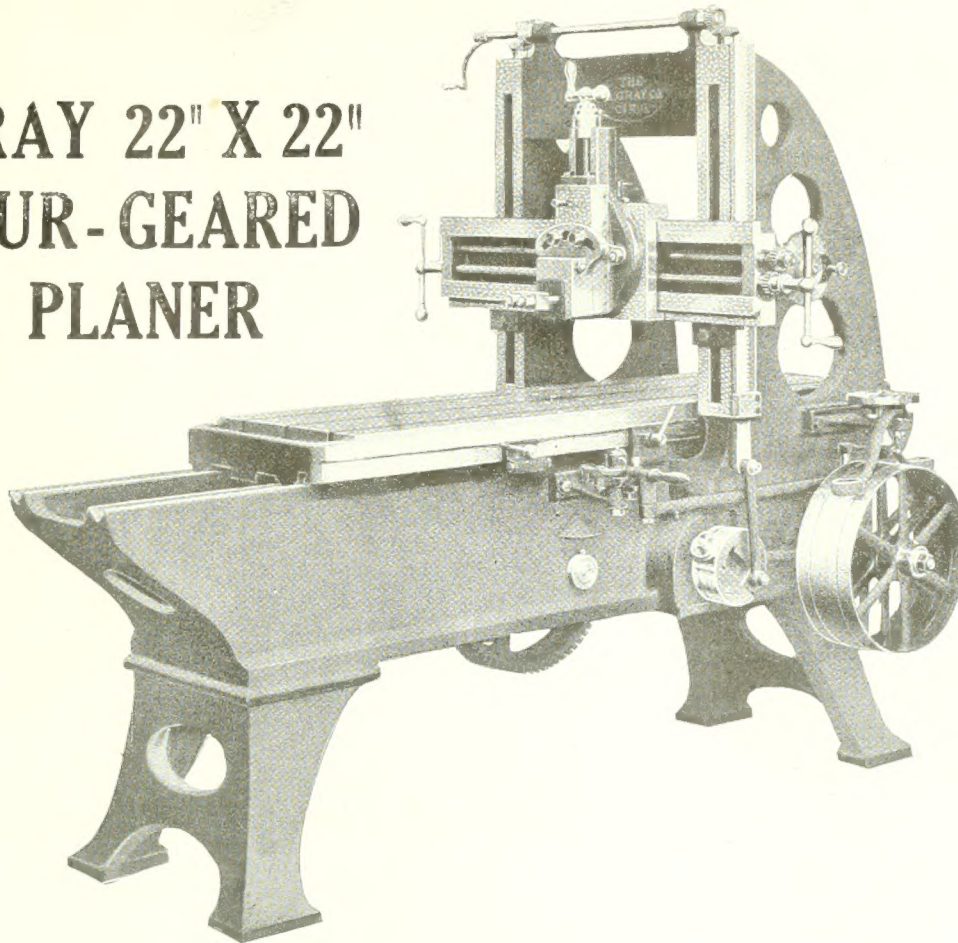
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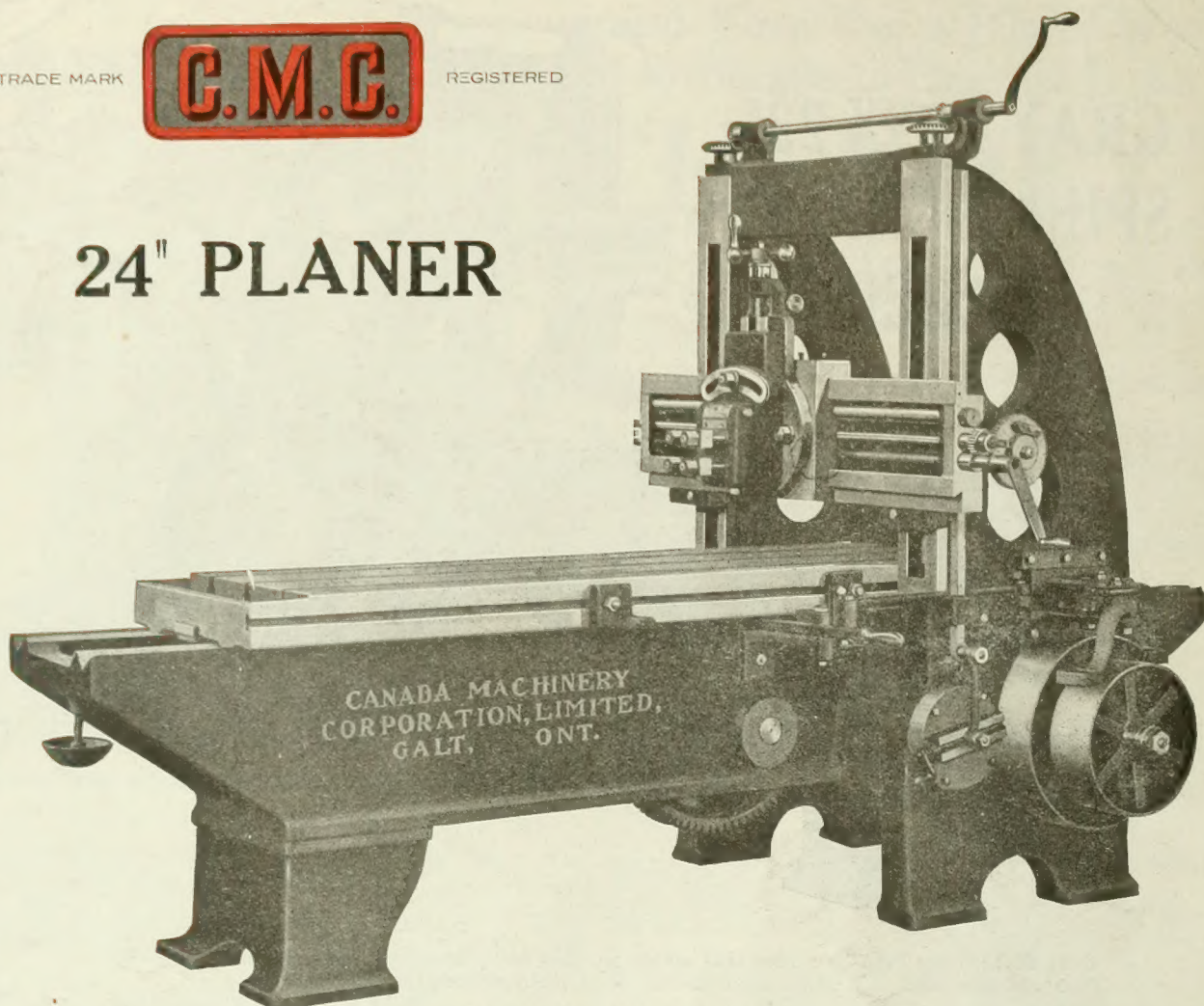
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